The Engineering and Mining Journal

VOL. LXXXVIII. NEW YORK, JULY 10, 1909. NO. 2.

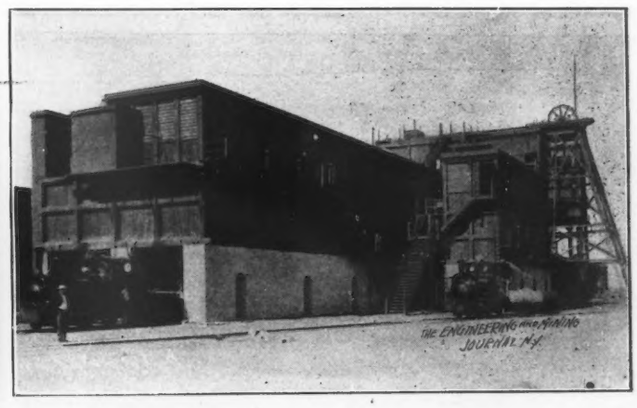
Wallaroo and Moonta Copper Mines and Smeltery

These South Australian Mines Have Been Profitably Worked for 50 Years; Moonta Mine Now Nearly Exhausted. Hancock Jig Developed Here

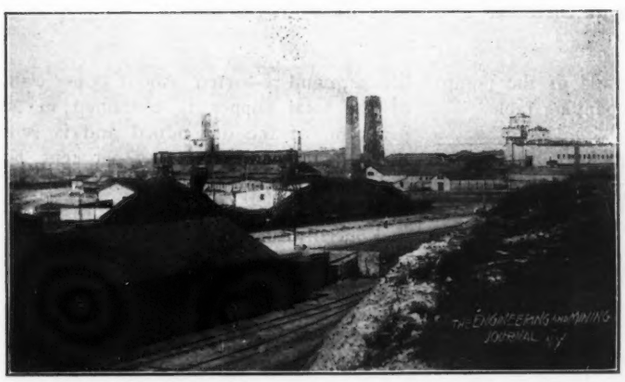
BY GERARD W. WILLIAMS*

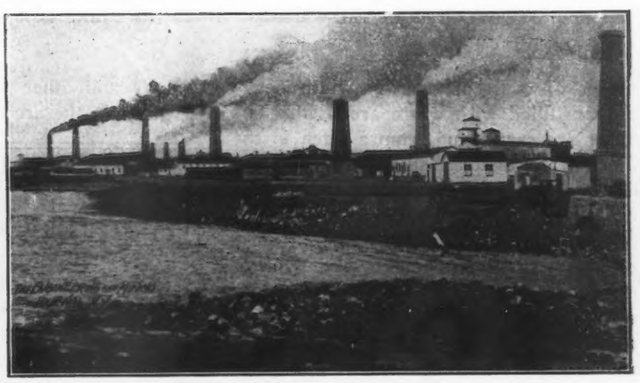
The mines and reduction works of the Wallaroo & Moonta Mining and Smelting Company are situated in Yorke peninsula, on the seaboard of the state of South Australia. The mines were discovered fifty years ago and they have been worked for half a century without intermission. The reduction works are situated on the shores of Wallaroo bay but the mines at Wallaroo and at Moonta are distant 7 and 10 miles respectively from the smeltery with which they are connected by rail. Originally worked as separate mines the two companies were amalgamated in 1889 and placed under the management of R. H. Hancock, father of the present general manager, Lipson Hancock. As the two mines are entirely different both as regards the nature and occurrence of the ore it will be well to consider them separately.

WALLAROO MINES—LOOKING EAST



ORE SORTING PLANT AT THE WALLAROO MINE





SMELTING AND REFINING PLANTS OF THE WALLAROO AND MOONTA COMPANY ON WALLAROO BAY, SOUTH AUSTRALIA

The Wallaroo Mines

At the Wallaroo mines the country rock is a metamorphic mica schist of Cambrian or pre-Cambrian age. There are several ore-producing bodies which run in a general east and west direction and which are connected in the western portion of the mines by oblique veins. These more or less continuous lodes of altered schist, impregnated with quartz carrying pyrite and chalcopyrite, were proved in the upper levels for a length of nearly 10,000 ft., but the bulk of the veins cut out in depth and at 2000 ft. the length of the pay shoot is only 1300 ft., with a further 600 ft. of mineralized lode which does not pay for extraction at present metal prices. The ore averages about 4 per cent. copper and this content has been well maintaned over the whole of the lower workings of the mine. With depth, however, the orebody has become less clearly defined and the lode matter carries pyroxene minerals to a greater extent than in the upper levels.

The entire surface of the district is covered with recent deposits of clay and limestone and the gently undulating country now cleared of scrub and covered with wheatfields, gives no hint of

*Mining engineer, Stock Exchange Club, Melbourne, Australia.

the lodes which lie beneath the surface, for South Australia since the advent of superphosphate manures promises to become the Australian Manitoba. The pioneer shaft sinker of this field was a kangaroo rat, and a shepherd on what was then an "out-back" sheep run noticed the copper stained stones cast up on the mound of earth produced by the excavations of the little marsupial. The Moonta mines were discovered in a similar manner. As previously stated the country rock is an altered mica schist. This rock swells when exposed and unless special precautions are taken heavy falls of ground are inevitable.

Mining Methods

Stoping is on the overhand system, but owing to the swelling of the country rock the filling has to be kept close up to the working faces. Heavy stulls are used in the smaller stopes (3 to 8 ft.) but in stopes of 9 ft. or over in width heavy pigsties filled with waste are used. The latter are carried up from a hitch in the footwall in inclined stopes or from the drive timber in vertical stopes until they brace against the hanging-wall or roof of the stope. The size and shape of these pigsties varies according to the requirements of the stope, some being 6 ft. square, others oblong and of larger dimensions. When tightly filled with waste and firmly braced against the hanging-wall they are capable of withstanding great pressure.

A stope is worked by taking off a few feet of thickness at one end and immediately building a sty to carry the new roof. At frequent intervals new sties are erected as the stope works along. In very bad ground the sties are almost continuous. This system, costly as it undoubtedly is, is the only safe method for working the ore. The sties are not recovered, being buried in the filling which is sent down to the stope from the mullock (waste) passes. In the levels no form of timbering can withstand the pressure from the walls and in consequence the drives are framed between continuous rows of solid timber sties. The formation of the latter are well shown in the illustrations which accompany this article, for which the photographs were specially taken. Machine drills are used in development work only; all actual ore winning is done by hand labor.

Pumping Installation.

The Wallaroo mine is very wet, 250,000 gal. being raised daily. There are two pumping installations, one for regular and one for emergency use. In the former there are 3 stations, at the 750-, 1230- and 1830-ft. level, respectively. The pumps are of the Worthington vertical, 3-throw, plunger type, fitted with a 3-speed Baker's change-gear by which they may be worked at 24, 31½ and 40 r.p.m. The capacity and other details of the pumps are given in the accompanying table.

PUMPS AT WALLAROO MINE.

Level.	Motors H.P.	Size, In.	Gallons Per Minute.		
			Slow.	Intermediate	Fast.
1830	25	5½x9	55	72	90
1230	40	7 x12	112	150	190
750	40 (2)	8½x12	170	220	275

The pumps are driven by British-Westinghouse constant-speed, 3-phase motors, direct connected. In the emergency scheme, pumps are at two stations, the 1830- and 1230-ft. levels. The pumps are similar in design to the regular pumps and each is coupled to a 60-h.p., 3-phase, variable-speed motor by double spur gearing. At 40 r.p.m., each pump delivers 220 gal. per min. and stops and starts automatically, being controlled by a float attachment in the sump which actuates a liquid starter. The shaft pipes are of cast iron, 6 in. in diameter and tested to 2240 pounds.

Ventilation of the deep levels is effected by means of a Waddell fan at the surface which supplies the 1350 level and downward. The shafts follow the footwall of the lode. Near the surface the dip averaged 70 deg. to the south but at 300 ft. the dip increases and becomes practically vertical. At 1800 ft. the orebody began to trend to the north and down to 2300 ft., the lowest level, a slight dip to the north is maintained.

Sorting and Concentration

The ore which consists of pyrite and chalcopyrite in a gangue of schist and quartz varies in copper content from 3.5 to 4 per cent. With copper at last year's prices it is not profitable to mine ore of less value than 4 per cent. At the surface the ore is passed over grizzlies and then sorted on picking belts, passed through breakers and re-sorted. About 55 per cent. of the total copper is contained in 22 per cent. of the ore mined and is sent direct to the smelters; 12.7 per cent. by weight is returned underground to be used for stope filling and the balance is sent to the concentrating plant. The ore which goes to the concentrating plant varies from 2.3 to 4 per cent. copper averaging about 3.3 per cent. and constituting 32 per cent. of the total copper in the ore mined. The waste used for filling carries 0.5 per cent. copper or 4.5 per cent. of the total copper. The direct smelting ore as sorted averages 9.8 per cent. copper.

The product sent to the concentrating plant is passed through two sets of cornish rolls which reduces it to ½-in. size and the product from the rolls, together with the finer portion removed by prior screening, passes to a Hancock jig. The jig effects a 55-per cent. recovery and the concentrates after draining are sent to the smelters. The tailings and mid-

LEVEL STIES IN THE WALLAROO MINES—SWELLING GROUND NECESSITATES UNUSUALLY HEAVY TIMBERING

dlings from the jig are sent to Krupp ball mills for reduction to 1.5-mm. size, after which they are elevated to spitzkasten for classification. The classified sands are further concentrated on Wilfley tables and the thickened slimes are treated on vanners and buddles. At present some accumulated sands are being fed to the ball mills and are retreated with the current jig tailings.

The Hancock Jig

The Hancock jig developed here by R. H. Hancock is extensively used in Australia and is also being installed in other parts of the mining world. The machine consists of a jig tank or hutch filled with water, in which a horizontal screen 16 to 20 ft. in length works with a combined vertical and horizontal movement, such that the ore upon it is not only subjected to a jigging action which stratifies it, but also to a progressive longitudinal movement which carries it along the screen toward the tail very much faster than is possible where this movement is produced only by the flow of water.

The richer portion of the material being treated makes its way downward through the "ragging" (course pieces of ore or other heavy material held in place by small crossbars of wood) and through the screen into the hutch, which is divided by cross partitions into a number of compartments for different grades of concentrates and middlings. The lighter waste remains on top and is quickly passed over the tail of the machine.

The operating mechanism consists of an arrangement of levers and supporting rods worked by a cam below the hutch, together with a device near the top of the hutch for giving the horizontal part of the motion.

The advantage which this machine possesses over other types of jigs is its great capacity, and its ability to handle successfully an unsized feed (from ½ in. down, in many cases) and thus obviate the expense and complication involved in installing a series of jigs and trommels. Apart from first cost, there is a notable saving in running expenses, through reduced maintenance and supervision.

At Wallaroo the waste which is sorted on the picking tables is sent to a separate crushing plant and is broken down to 1⅛ in. before it is sent underground for filling. Most of the various plants are electrically driven. Eight Babcock & Wilcox boilers (2000 h.p.) supply steam to three Bellis-Morcom direct-connected generating sets, three powerful compressors and a ventilating engine. The boilers are fitted with chain stokers, economizers and superheaters. A few years ago a serious fire in the mine destroyed the upper portion of the main shaft and a new shaft was sunk 840 ft. to join the main shaft below the fire area.

The Moonta Mine

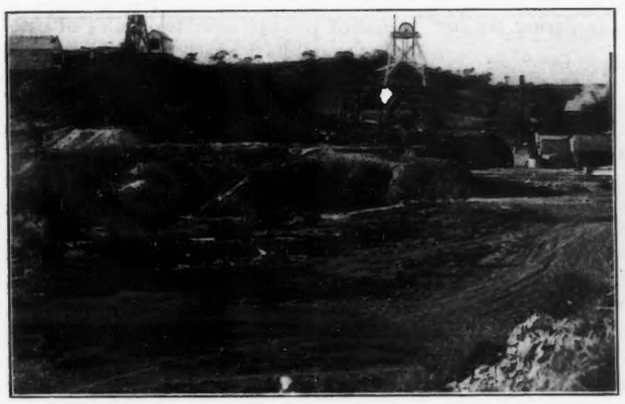
The country rock at Moonta consists of an intensely hard felsite-porphyry. The ore bodies are fairly regular and are often marked by a well defined band of quartz on the footwall. The mineral, chalcopyrite, occurs in the quartz and also in the country rock itself, as at the Wallaroo mines, the ore here appears to be deposited along parallel stress planes in the rock. Within a width of about half a mile several lodes were discovered, of which five were of importance. These lodes strike north and south and dip to the west at angles varying from 49 to 65 degrees.

As most of these lodes have been worked out it is not necessary to go into any detailed description of their individual characteristics. Although characterized by exceptional richness (for many years the mine raised nothing but 20 per cent. ore), none of the lodes persisted below 2000 ft. The mine has been explored to 2500 ft. but there is practically no payable ore below 2000 ft. A peculiarity of the Moonta lodes was the occurrence of bonanza or "wallows" as they are termed locally, in the foot- and hanging-walls of the lodes. These pockets of ore were at times of phenomenal richness and varied in size from a few score to many hundreds of tons.

The orebodies proper ranged up to 40 ft. in width and were in many cases of considerable extent; thus, Beddome's lode was worked for 2500 ft. in length and to a depth of 1200 ft.; Greene's lode was worked successfully for a length of 1200 to 1500 ft. and to a depth of 1000 ft.; Taylor's lode was worked for 3000 ft. in length in the upper levels and for 2000 ft. at 1600 ft. This lode has been followed down for 2500 ft., but below 2000 ft. it narrowed and the chalcopyrite being replaced by pyrite, it became of no value. The lode is characterized by the presence of a persistent band of quartz on the footwall side varying in width from a few inches to three or four feet.

Although very hard, both the lode matter and the country rock stand well and give no trouble in stoping. The lode matter is much softer than the country and in consequence of this the shafts are mostly sunk in the lode and not in the country rock. Wheel skips are used for hoisting. In the old days the ore was mined by underhand stoping and, to save timbering, pillars of ore were left in. These pillars run from level to level and vary in width from 20 to 40 ft. With the exception of a small amount of low-grade ore won from a short lode known as Treuer's lode, these pillars of ore form the sole source of supply for the mine which is now but the skeleton of its former self.

As stated previously the country stands well but of recent years the mine has been subject to what are locally known as "earth shocks" due to slide movements of the entire hanging-wall. These movements, the natural outcome of the method of working in former days when little or no filling was used in the stopes, have rendered the task of removing the remaining pillars one of considerable difficulty. Massive sties of solid timber round sticks about six inches in diameter



MOUNT ELLIOTT COPPER MINE—SOUTH AUSTRALIA

MOUNT CUTHBERT COPPER MINE—SOUTH AUSTRALIA

notched and joggled, are built up alongside of the bridge of ore which is to be removed and as the ore is broken out small sties filled with waste are built at frequent intervals and the whole space is packed with waste sent down from the surface. This is a costly operation but absolutely essential for safe working. In many cases the bridges of ore are strained and crushed as a result of the movements of the hanging-wall previously referred to. All ore is broken by hand labor.

General Mining Costs

All mining work is by contract and the prices are based on a sliding scale, being set to return approximately the weekly wage shown in the accompanying table.

WAGE BASIS AT WALLAROO AND MOONTA.

Price of Copper, Per Ton (2240 lb.)	Bonus, Per Cent.	Total Weekly Wages of Hand Miners.		Weekly Wages of Machine Men, Both Mines.
		Wallaroo	Moonta.	
Under $300...	nil	$10.56	$9.60	$11.52
Between $300 and $325...	10	11.52	10.56	12.48
Between $325 and $400...	15	12.00	11.04	12.96
Between $400 and $475...	20	12.48	11.52	13.44
er $475....	25	12.96	12.00	13.92

Prices are set at so much per linear or running fathom and the price includes explosives, timbering, tramming and mullocking. The contractors are also responsible for the selection of the necessary timber at the surface and for its conveyance under ground. The distribution of the miner's working time is about as follows:

Getting timber, erecting sties and other timber work, 47 per cent.; actual breaking, 36; filling depleted stopes, 8; tramming, 9. At Wallaroo 276 men in the stopes broke 106,180 tons during 1908 so that the rate of breaking after allowing for work other than mining is 3.3 to 3.4 tons (2240 lb.) per shift of eight hours. From lodes averaging about 10 ft. this is good work for hand miners and compares favorably with the work done on any Australian field.

For the year ending December, 1907, the cost of mining inclusive of development and maintenance was $6.14 at Wallaroo and $5.36 at Moonta, but development at Wallaroo is in the neighborhood of $1.30 per ton. During this period wages were higher than they were during 1908 so that a substantial reduction in mining cost was effected in 1908. Incidentally a reduction of hands employed during 1908 has resulted in the elimination of the least efficient, and today, despite greatly reduced tonnage, costs are lower than during the period of high metal prices. Australia possesses no reserve of labor, consequently periods of high metal prices which naturally means increased output throughout the country are characterized by low efficiency on the part of the workers, who practically can command their own price and increase the working cost.

Wallaroo and Moonta have been singularly free from those labor troubles which are almost endemic in Australia and which do so much to retard progress. For many years the townships which surround the mines were virtually a Cornish village preserving intact the clannish feeling and innate conservatism that characterizes the Cornish mining community. Under the almost patriarchal rule of "Captain" R. H. Hancock the camp remained free from external interference and though of later years the district has lost its essentially exotic appearance, the spirit remains and the men have retained full confidence in the present general manager. Nothing impressed me more during my visit than the good relationship existing between the men and the mine officials and it is due to this that the camp has so far remained free from those labor troubles which have been so prominent on other fields during the last few years.

Concentration at Moonta.

The ore raised from the various shafts is trammed to the central sorting plant. Passing through a Gates breaker which reduces it to 2½-in. size, the material is then elevated, automatically sampled and trommeled, the fines falling into bins for direct smelting if rich enough. The oversize passes over sorting belts where a small quantity of ore is sorted for the smelter. The concentrating ore is passed through Blake crushers, rolls and trommels to a Hancock jig. The jig tailings are not further treated but are sent to the cementation heaps. The jig recovers 60 per cent. from a product crushed to ½-in. size. On a finer product the Wallaroo jigs recover 55 per cent., the difference being largely due to the difference in specific gravity of the two gangues which is 2.95 at Wallaroo whereas the Moonta felsite-porphyry is 2.67. The fines from the trommels are passed over Wilfley tables.

The Moonta ores now average about 4 per cent. copper, and after passing over the sorting table, smelting ore assaying 15.5 per cent. copper is obtained, this product being about 5 per cent. of the total mined. The waste amounts to 6.2 per cent. by weight and the balance, 88.5 per cent., is sent to the concentrator. The concentrating ore averages 3.5 per cent. and contains 79.1 per cent. of the total copper content of the mine product. The ore-breaking and sorting cost amounts to 17c. per long ton and the total dressing and concentrating cost is $1.20. The capacity of the jigs on 4-mesh feed at this plant is 25 tons per hour. The Wilfley table capacities average about 0.5 tons per hour.

Cementation

The tailings from the concentration works at Moonta are stacked in large heaps standing on specially prepared ground, drained and graded to effect rapid collection of all liquors percolating through the heaps. The heaps vary in hight from 30 to 60 ft. and cover an area of 20 acres. The surface is divided by irrigation furrows arranged in 12 ft. squares so that only a portion of each heap is irrigated at one time. Exposure to air and moisture converts the copper-iron sulphides into soluble sulphates which are removed by the percolating water. The presence of soluble salts of iron in the circulating water accelerates the action.

The circulating water contains about 100 grains per gallon of ferrous sulphate and a trace of free sulphuric acid. It is pumped to the top of the heaps by Worthington duplex acid-resisting pumps which deliver 30,000 to 40,000 gal. per hr. as required through over two miles of cast-iron, wood-lined pipes. The mine water is supplemented by sea water pumped from Moonta bay, a few miles distant. The drainage liquors are conveyed through earthenware pipes to six wood-lined masonry tanks each 60 x 30 x 3½ ft. deep. The first two serve as clarifying tanks; the others are filled with scrap iron for precipitation.

From the vats the liquors gravitate through 3000 ft. of wood-lined canals 2 ft. 8 in. wide and 8 in. deep. At the end of the canals the water is practically free from copper and is returned to the heaps. The latter contain 1,300,000 tons, estimated to assay 0.9 per cent. copper at the start, but about 50 per cent. of the total metal has been recovered. Last year's yield was 500 tons of fine copper recovered at a cost of $200 per ton for smelted tough pitch metal, or approximately 9c. per pound. The ore at Wallaroo is not very amenable to this form of treatment and only about 50 tons per annum are recovered from this source. In consequence of this, closer concentration is resorted to in order to increase the recovery. Naturally the output from any heap decreases every year but so far the heaps are all producing copper at a remunerative price.

The accumulated slimes are treated by agitation with dilute sulphuric acid in wooden vats. The agitated pulp is returned to the dams and the copper-bearing solutions are sent to the precipitating canals. The slimes require several treatments before complete extraction is obtained. By draining off the dams, drying the surface and ploughing it over so as to expose fresh surface to the air, the slimes so treated give a better recovery when agitated with acid. The method is

costly but profitable with good metal prices.

Smelting and Refining

The smelting and refining plants are situated on the shores of Wallaroo bay and are connected with the government railway system. In order to produce a 45 to 50 per cent. matte the ores and concentrates from the mines are partially desulphurized. The ore is roasted in nests of brick cells, strongly cased in cast iron, which are each capable of treating 350 tons per week. The ore is elevated to hoppers and is dropped through gates to the burning ore beneath. The charge rests on square grate bars which are turned every 24 hours, the roasted ore falling into the pit beneath. About 70 per cent. of the sulphur is removed and the gases are drawn through the sulphuric acid chambers on their way to the stack. The acid works has a capacity of 120 tons per week of 65 deg. acid. This is used about the plant and the balance sold to a phosphate factory which adjoins the smeltery.

The fine ore is desulphurized in cast-iron pots holding about 8 tons each. A mixture of fines and concentrates is elevated, wetted and charged on a small fire in the pots. The blast is gradually increased as the charge is fed until a maximum of 12 oz. is attained. When the top of the charge is red hot the pots are tipped and the sintered mass falls on cones which break it up. The sinter contains about 25 per cent. of the total sulphur in the crude ore. The sintered ore, together with raw ore, limestone and ironstone, is smelted in two blast furnaces. The matte runs from 45 to 50 per cent. copper and the slag 0.5 per cent. The latter is granulated, elevated to railway trucks and used for filling stopes in the mines.

The matte is "bottomed" in reverberatory furnaces, about 8 per cent. of the copper being thrown down to act as a collector for the small quantities of gold and silver which occur in the matte. The regulus is brought to tough copper in another set of furnaces and then sent to the refinery. The "bottoms" and roaster slags are treated in the "foul-copper" department. A rough copper, produced by melting the slag and roasting the matte so obtained, is melted with the "bottoms" and cast in anodes containing about 99 per cent. copper. These are treated in the electrolytic refinery and the electrolytic copper sent to the refinery. The refinery mud is boiled with sulphuric acid in lead vats, washed, dried and smelted with lead. The product is cupelled, parted electrolytically and cast into ingots.

The flue dust produced during matte concentration is treated with acid and the copper converted into sulphate, which is refined and crystallized. It is sold to the telegraph department of the government. In the refinery the copper from the reverberatory, from the electrolytic department and from the cementation works is melted and finally cast as Wallaroo Tough Pitch copper. This has for many years been one of the brands used by the British and French ordnance departments. It is also used for coinage in India and China.

Smelting Costs

Smelting, including refining, costs between $90 and $100 per ton of metal, according to the rate of wages which are on a sliding scale according to metal prices. For the year 1907 the cost of production was $330 per ton of metal, inclusive of all production and selling costs. Owing to the price of metal the company was enabled to work up lower-grade ore than is at present practicable. For the year 1908 the cost was reduced to $275, the crude ore averaging 4 per cent. The accompanying table shows the annual work done by the company as obtained from the average of several recent years. At present the grade of ore mined has been raised to 4 per cent. in order to cope with copper at $300 per ton.

DATA OF YEARLY OPERATIONS.

	Wallaroo.	Moonta.
Tons of crude ore raised	129,000	58,000
Per cent. copper in crude ore	3.65	3.9
Tons of dressed ore from above	43,000	12,000
Per cent. copper in dressed ore	9.1	13.4
Per cent. recovery by sorting and concentration	85.8	73.6
Tons of precipitate from cementation	59	800
Per cent. copper in precipitate	72.5	78.5

Other data of interest regarding the annual production are as follows: Ore smelted, including precipitate, purchased ores and mattes, 61,000 tons; refined copper produced, 7300 tons; electrolytic copper included in above, 780 tons; copper sulphate, 275 tons; sulphuric acid, 5200 tons; fine gold, 2000 oz.; silver (996 fine), 5800 oz.; development during year by shafts, 620 ft.; by levels and crosscuts, 2700 ft.; by winzes and raises, 1900 feet.

General Conditions

The average number of employees is 2300. An area of 4137 acres is held under mineral lease for a term of 99 years of which 70 are to run. The rental is 24c. per acre per annum and a royalty of 2½ per cent. on the declared profits. During the fifty years of operation, dividends amounting to $10,300,000 have been paid, this profit being derived from the treatment of 1,758,983 tons of dressed ore, averaging 15 per cent. copper. The Moonta mine, prior to amalgamation with the Wallaroo, was the first mine in Australasia to pay one million sterling ($5,000,000) in dividends.

The mines lie rather out of the track of the average visitor to the Australian mining fields and in almost every respect the local conditions of mining, metallurgy and labor are different from those obtaining on other fields. The company is sometimes accused of perpetuating old and wasteful methods, but having in view the comparatively small reserves of ore, for Moonta is practically a dead mine, it is not easy to see how any considerable capital outlay at the mining plant would be justified. As far as the actual mining methods are concerned they are the outcome of wide experience in the mine and, although costly, there is no possibility of altering them without grave risk both to the mine and the workers. It seems probable that the installation of a converter plant would prove more profitable than the present method of producing tough pitch copper and such a plant may be installed. I desire to record my thanks to Lipson Hancock and his staff for the courtesy extended to me during my visit to the mines and for the data and photographs which were supplied for the purpose of this article.

Asbestos in Japan

Special Correspondence

A recent report from the Canadian Trade Commission says that asbestos is produced at several places in Japan, especially in Kiushiu, but the quality does not compare favorably with the production of foreign countries. The local product should perhaps be classed as a kind of serpentine. Although good material was once produced in Nagasaki in the Kiushiu district, the mine seems to be exhausted now. As the Japanese asbestos is not suitable for manufacturing purposes when taken alone, foreign material is imported for the purpose of mixing with the local product. It is difficult to get exact figures as it is not specified in the customs returns. Asbestos sheets, a manufactured article, were imported in 1907 to the amount of 428,671 lb., valued at 41,843 yen ($20,921), Germany being the leading country of supply. Under the item "packing for engines," which contains a large quantity of asbestos, the value of imports for 1906 is given at $392,863 yen ($196,481), and for 1907 at 295,501 yen ($147,720). The principal customer for asbestos sheeting or packing is the navy; large manufacturing establishments also use it. There is an encouraging future for this business on account of the general expansion of the industries which use asbestos materials and there will also be a good market for the raw material. The most important manufacturer of asbestos articles in Japan is the Japan Asbestos Company with headquarters at Osaka.

The addition of about 5 per cent. of quicklime to sour, soggy clays and soils will, to a large degree, prevent the corrosion of imbedded iron or steel.

The Gowganda Region in Ontario

SPECIAL CORRESPONDENCE

An intersting report[1] on the new Gowganda district in Ontario has just been issued by the Geological Survey of Canada. This district, about which a great many reports from prospectors and others have been heard lately, is in the Montreal river region, in the extreme western part of the Nipissing district in the neighborhood of north latitude 47.45 deg., and about 85 miles north of the town of Sudbury. It includes an area of 350 square miles, most of which lies between two large branches of the Montreal river which empties into Lake Temiskaming on the west side. During the past season a prismatic compass and tachymeter survey was made of both branches of the Montreal river and the adjoining navigable waters. The geological work in connection with the survey was performed by W. H. Collins, assisted by T. Firth, and in addition to a thorough examination of the surveyed routes, the intervening country was examined so far as time and opportunity would permit. As a continuation of the work is anticipated the results are submitted as incomplete and subject to revision.

CHARACTERISTICS OF THE MONTREAL RIVER REGION

The Montreal river district does not differ essentially from the Cobalt or other neighboring districts. The surface has the same rugged monotony of the pre-Cambrian peneplain, relieved somewhat by ridges of Huronian, standing from 300 to 500 ft. above the general level. The country is well watered and offers exceptional facilities for canoe travel. Pleistocene deposits are thin, and nearly everywhere the rock formations are well exposed. The entire region is underlaid by a basement complex, either appearing at the surface or hidden beneath areas of Huronian sediments. This basement consists largely of Laurentian biotite and hornblende gneisses, with patches of vertically foliated Keewatin schists caught up in the former; the intervening contacts forming indefinite zones, in which intrusive action is manifested. The basement complex, referred to throughout the report as the Archean, possesses a peneplaned surface, not greatly different from the present one, which is well preserved where overlain by erosion remnants of Huronian sedimentary rocks, but has elsewhere been further denuded. The Lower Huronian rocks are of clastic nature, consisting in ascending order of conglomerate, greywacké, slate and quartzite, which pass conformably into an upper conglomerate; while a granite-like arkose member is believed, from its similarity to rocks of the same character in the Cobalt area, to be possibly of later, Middle Huronian age. A later intrusion of quartz-diabase has developed a system of dikes in the Archean and large tongue-shaped areas in the Huronian, believed to represent sills of several hundred feet thickness, lying in the bedding planes of the Huronian sediments. The diabase magma has been notably differentiated, giving rise to forms ranging from gabbroid to syenite in composition, and to younger aplite dikes. With the diabase is associated a group of veins, containing an association of cobalt and silver identical with that of Cobalt and vicinity. The veins cut both diabase and aplite as well as the Huronian, and are, therefore, younger, but probably not much younger than the aplite, since they contain some of the minerals found in them. So far as known, the distribution of the veins is confined to the larger diabase areas, the dikes and smaller bodies, being undifferentiated and unmineralized; but the Huronian adjacent to the diabase also contains veins, somewhat more silicious, yet evidently of the same age as the others. Alteration and impregnation of the country rock has taken place to an unknown but, presumably, limited extent. Some of the veins are remarkably rich and many of them occupy persistent well-defined fissures. Though the cause of these fissures is not known, they appear too large and continuous to have resulted from contraction alone.

SURFACE CHARACTERISTICS

The general surface of the region may be characterized as a comparatively low relief, the hills not often rising over 200 ft.; but here and there are conspicuous elevations. Structurally they appear to be in a few cases resistant knobs of Keewatin projecting well above the general level, but more commonly they are tilted ridges of Huronian. Within Huronian areas there is a distinct tendency toward the development of parallel ridges. The post-Huronian diabase is an equally potent factor, peculiarly distinctive features marking its contacts with the Huronian. These contacts appear to be zones of low erosive resistance and are commonly coincident with ravines, walled on one side by diabase and on the other by Huronian. The diabase with which the silver deposits are associated penetrates both the Archean and Huronian, but is ordinarily distinguishable by its unusual freshness, dark color and crystalline appearance. In certain cases it is liable to be confused with other diabase types. Magmatic differentiative processes have resulted in differences in appearance and mineralogical composition, one type being a pink aplite occurring in dike form. Olivine diabase dikes are also present, but in far less abundance. The intrusion of the quartz diabase into the Huronian was gently accomplished at most points, and the beds of the latter, both above and below the intrusives, are inclined only a few degrees more steeply than in localities where no diabase can be found. Ordinarily contacts occur in low ground, especially in ravines, the bottoms of which are filled with soil, and consequently unfavorable for geological observation; but at some points where the contacts are exposed the Huronian is seen to be much fractured across a zone extending many feet from the diabase. In the neighborhood of these contacts the Huronian is well supplied with quartz veins, whose "comb" structure and chalcopyrite-galena mineralization identify them with similar veins in the diabase.

CHARACTERISTICS OF THE DIABASE

Quartz diabase bodies are not restricted to any one formation or locality, but occur with various dimensions over the whole area with the exception of the country lying northwest of Duncan lake. Virtually all the large areas are inclosed by Huronian, the bodies within the Archean being numerous but small. In the Archean practically all of the observed diabase bodies are dikes, in approximately vertical positions, seldom 100 ft. in width and of undetermined length. In some cases those in the Huronian are sills, whose greater exposed dimensions are parallel to the bedding planes of the inclosing sedimentaries. It is fortunate for the easy recognition of the diabase that it is more or less continuously exposed, and that there are not many other igneous rocks of similar character in its proximity, for it presents a variety of types showing great petrological differences. The common type is a dark green massive diabase, ranging in texture from one in which the individual minerals are barely distinguishable to others containing amphibole crystals an inch in length. In the dikes the mineralogical composition is tolerably constant, specimens selected from different points showing no notable difference except that they are usually less decomposed than the coarse-grained varieties.

DIKE FORMATIONS

Diabase is most abundantly exposed in the area between Gowganda lake and the portage route connecting Forth and Eckhorn lakes where it forms three parallel tongues of approximately equal dimensions. Coarse-grained types prevail, in which the differentiations of acid phases are pronounced. Aplite dikes up to 10 ft. in width, fairly coarse-grained and sometimes tolerably rich in dark constituents, are abundant. Diabase dikes are probably numerous and widespread, but this can be determined only by closer examination. They are most frequently seen in the Laurentian, probably not so much because they are more numerous there, but be-

[1] "Preliminary Report on Gowganda Mining Division, District of Nipissing, Ontario." By W. H. Collins. Pp. 47; 9½x6½ in. Paper; illustrated. Ottawa, 1909; Geological Survey of Canada.

cause they are more conspicuous in the granite than in the Keewatin schists and Huronian, from which they differ less in color. They attain widths of 60 ft., 100 ft., or more. With the knowledge acquired from the exploitation of James township and other recently discovered silver camps, prospectors in the Montreal river district gave exclusive attention to the diabase formation. The first discoveries of native silver in the Gowganda region were made on Aug. 4, 1908, in the diabase just west of Gowganda lake, and the remarkably rich surface showings at once arrested the attention of prospectors. The known silver-bearing area of that district is stated as being restricted to about 10 square miles lying between Gowganda lake and the portage route from Elkhorn to Forth lake, commonly known as Gowganda. As extensive prospecting only commenced in September last, about the close of the field season, only the earlier discoveries were known to the author of the report which is necessarily incomplete as regards the present status of the Gowganda camp.

Conditions of Exploration

Conditions in the region are such as to demand exploration of the closest order, for the indications of mineralization are negative rather than positive in character. In addition to forest vegetation and moss, glacial material is sometimes thick enough to render surface exploration arduous and expensive. The veins are also eroded more deeply than the country rock and the crevices filled with soil and rendered inconspicuous. Were the country flat the difficulties in the way of prospecting would be more serious, but fortunately it is rugged, especially near the diabase, the sides of the ridges being bare or easily exposed. The first silver discoveries were made in the sides of rock walls. The pink bloom found at the surfaces of the veins and the adjacent country rock is also a valuable indication. The deposits are in the form of well-defined veins occupying fissures in the diabase. In September last a few had been traced for distances of 300 or 400 ft., so that they may be said to occupy persistent fissures. The diabase shows no signs of extensive deformation, all geological evidence indicating that since its solidification its history has been uneventful. Besides the strong veins there are others of the gash type, but the latter are small, not very continuous and poorly or not at all mineralized. From comparison of veins at Gowganda, Duncan lake and Wapus creek, a general uniformity of structure, though not of mineralization, is found to obtain. The whole mineral association is not found in any one vein, nor are the relative proportions either of ore or gangue at all constant. The gangue materials are quartz and calcite, always mutually arranged in definite manner. The sides of the veins are composed of white quartz which may form an insignificant coating on the walls, or may occupy the whole space, but in all cases there remains a central cavity into which the pointed ends of quartz crystals projects freely. Veins with predominant quartz filling seem especially abundant in the Huronian adjacent to the diabase. The rich veins near Gowganda, so far as ascertainable, are poor in quartz. Practically all of them carry chalcopyrite either as diffuse grains or in considerable amounts. Pyrite is equally abundant but less constant and galena is not uncommon.

Gowganda and Cobalt

Present knowledge of the Gowganda area indicates it to be highly mineralized and the number of discoveries is steadily increasing. The area and character of the mineral association and the richness of the surface showings are comparable with those of Cobalt. There is a general similarity in the geological conditions. The mineralized veins in Gowganda occur in the diabase, as do some of the good Cobalt veins. There are local differences, but the resemblances are more pronounced than the differences and lead to the hope that exploitation will reveal similar underground conditions. The well mineralized veins are sufficiently long and uniform on the surface to suggest similarly persistent vertical dimensions. While there are grounds for hoping that the veins will persist in depth, this has not been proved, nor if this is the case, that the mineralization and values are also persistent.

The relative importance of Gowganda is, therefore, a matter of uncertainty, but it may be confidently affirmed that for its state of development the outlook is very favorable, and the number of veins, area of mineralization and rich surface showings afford good ground for hoping that some, at least, of the veins will be found to be commercially important.

Other Minerals

The report concludes with references to the other valuable minerals of the region. The chalcopyrite is confined to veins a few inches in width and so scattered as to render them valueless. Specimens of specular and kidney iron ore found a short distance east of Nest lake proved of excellent character with little admixture of silica or foreign matter, but the extent of the deposits is not known. Specular ore also occurs in other localities. Magnetite occurs half a mile to the northeast of Gowganda lake, but the percentage of iron is small. Asbestos occurs in two localities in the Keewatin area between Firth and Obushkong lakes, but whether it exists in commercial quantities is not known.

Statistics collected for The Mineral Industry show that the production of asbestos in the United States for 1908 was 1350 short tons, worth $24,000.

A New Pyrometer

A new pyrometer for the measurement of high temperatures, known as the Féry spiral pyrometer, has been brought out by the Cambridge Scientific Instrument Company, Limited, Chesterton Road, Cambridge, England. The new instrument is simple in principle and construction. Instead of the heat rays being concentrated on a thermo-electric couple, as in earlier instruments, they are focused on a small bi-metallic strip made of two metals rolled into the form of a spiral, which unrolls when heated, owing to the largely different coefficient of expansion of the metals used.

In order to eliminate errors which may arise through change in the actual temperature of the instrument, an adjustment is provided by which the center rods supporting the spiral may be turned and thus the needle set to the zero on the scale. Extreme precision is not claimed for the new instrument, but an accuracy of between 1 and 2 per cent. is readily obtainable.

The Exploration Company

The directors of the Exploration Company, of London, have issued a report for the year 1908, showing a net realized profit of £60,000 in round figures. This is a great improvement over the results obtained in the previous year when a heavy loss was sustained, owing to unfortunate investments in copper and kafir shares. The directors give no detailed particulars of their investments, but state that they continue to hold a large interest in Mexican mining companies, which are earning satisfactory profits. The chairman of the company, R. T. Bayliss, has recently returned from an extended visit to Mexico, and as a result of his investigations, it is intended to undertake the development of mining properties in that Republic on a larger scale than heretofore.

As shown by reports collected for The Mineral Industry the production of tungsten concentrates in the United States fell off heavily in 1908, amounting to only 497 short tons ($126,281) against 1468 short tons ($715,031) in 1907.

There was 110,225 long tons ($220,225) of manganese residuum produced in the United States in 1908 according to figures of The Mineral Industry U. S. Geol. survey figures for 1907 give the output for that year as 277,163 long tons ($463,989).

The Mount Bischoff Tin Mining Company recently paid its 383d dividend, according to the *New Zealand Mines Record*, April 6, 1909. The amount paid is £3000, which brings the total disbursements to date to £2,166,000, or £180 10s. per share.

Revival of Mining in the Mogollons, New Mex.

A Remote Mining District; Discovered in the Early 80's; Low-grade Gold and Silver Ore at the Surface, Becoming Richer with Depth

BY E. GYBBON SPILSBURY*

The Mogollons consist of a series of detached mountain ranges in New Mexico and Arizona having a general southeast and northwest direction, and distinct from the main ranges of the Rocky Mountains whose general course is more to the north and south. They form the northerly water shed of the Gila drainage basin, and the Gila river itself takes its source from the eastern end of the range in Grant county, New Mexico.

Taken as a whole, the Mogollons have so far not been proved as great mineral producers. While a great deal of early prospecting was carried on throughout their extent, the only real discoveries of value appear to have been concentrated on one line of fissuring which occurs along the western escarpment of the range in Socorro county, New Mexico, where it is cut by the San Francisco river, a tributary of the Gila.

The extent of the mineralized area is not large, its known length being not much over 10 miles, while its width is about 3½ miles. It is roughly bounded by Mineral creek on the north and Whitewater creek on the south. Between these two creeks, which cut through the range in deep cañons, is a third, almost parallel, creek known as Silver creek. All of these streams flow into the San Francisco river.

The town of Mogollon, the center of the Cooney mining district in which all the principal mines are located, is situated in Silver creek cañon about six miles above its junction with the San Francisco river. The nearest available railroad connection is at Silver City, the terminus of the Rincon Branch of the Atchison, Topeka & Santa Fe Railroad. The distance between Silver City and Mogollon is ninety miles over very indifferent roads. There is daily communication between these two points by stage, the trip taking from 14 to 18 hours depending on the condition of the road. Recently telephonic communication has also been established between both places.

The Cooney mining district is quite an old one for this territory, the first mines having been discovered in the early 80's, but regular mining only dates back to the time when the Indian troubles were terminated about 17 years ago. The first deep mining was carried on in Mineral creek cañon, at the Cooney mine, which was opened and worked for copper and silver. For many years this property proved remunerative when worked under lease by Thomas F. Cooney, but so far it has not proved a financial success under corporate management. The ores consist of copper and iron sulphides carrying small percentages of gold and silver. The main orebody has been followed down 650 to 700 ft., at which depth the iron sulphides appear to predominate to the almost total exclusion of copper, but are claimed now to carry fairly high amounts

BRIDGE FOR PIPE LINE

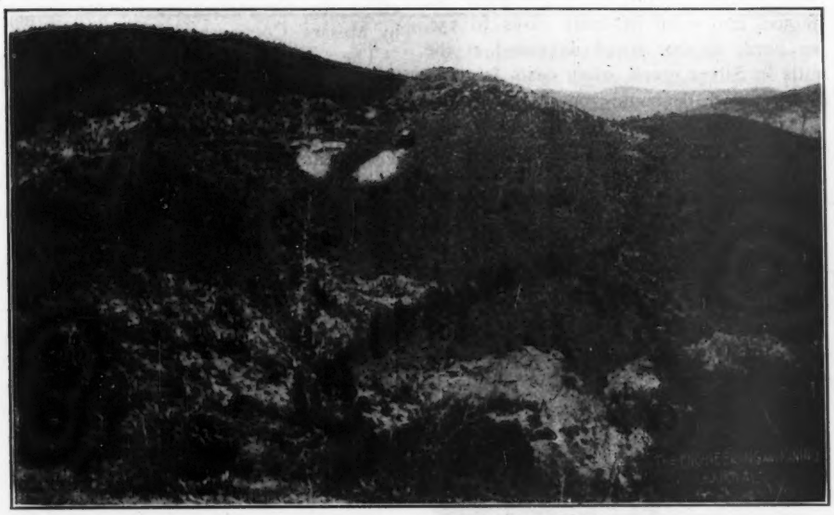
THE WHITEWATER ROAD

*Consulting mining engineer, 45 Broadway, New York.

of gold and silver. If this should prove to be the fact, the method of treatment, which is now by concentration, may require to be changed by the addition of a cyanide plant.

There is only one other active mine in this cañon, the Enterprise, and that is now passing through the development stage.

The real center of the mineral deposits of the District lies over in Silver creek cañon and west of Mogollon. In this area several properties have been opened and operated sufficiently to warrant the erection of milling facilities of one kind and another.



LITTLE FANNY MINE, MOGOLLON, N. M.

Geology and Ore Deposits.

The general formation of the district is eruptive, chiefly rhyolite and andesite, and apparently there has been more than one flow of each of these rocks. The andesite is overlaid by a highly silicious rhyolite on which again we find what is probably a more recent andesite. There are two general lines of fracturing through these measures, along which the subsequent mineralization of the material in the fissures has taken place. The most prominent of these fractures has a north and south direction, and can be traced by its bold outcrop for over ten miles. It is known as the Queen vein and has a width of from 100 to 150 ft. dipping about 80 deg. to the east. The other fractures have an east and west trend, and are only mineral bearing in the western side of the main dike. As a rule, the fissuring occurs along the contact planes between the rhyolite or porphyry, and the andesite flows, but it is by no means uncommon for the fissure to cross entirely from one eruptive to the other, with no change of vein characteristics excepting that of its walls. This fact renders it necessary to exercise great care in driving so as not to lose the ore-bearing portion of the vein whenever it leaves the contact plane. Evidences of mistakes of this kind are common in all the old mines of the district. The shibboleth of the miner in this camp appears to have been an andesite footwall, and a so-called quartz porphyry hanging-wall, and his persistence in following these indications often resulted in long stretches of barren ground, where later on, cross cutting has shown the continuity of the original orebody on the footwall side of the vein.

CRAIG'S MILL AND BOARDING HOUSE

The filling of the footwall or westerly side of the "Queen" vein, consists of quartz, generally massive, and much cross fissured, carrying silver sulphides, chlorides, and gold, in varying percentages. Next to this footwall quartz seam occurs a filling of calcite, or calcite and quartz, which attains a width in places of over 60 ft. This hanging-wall calcite deposit carries no values except sporadically; in fact the same may be said of the footwall quartz vein, although this latter generally shows from a trace to $2.00 per ton in gold and silver. While the Queen vein itself has not been proved to carry pay ore over any length, it is by no means improbable that rich orebodies will be found in depth on the footwall quartz seam, at or near the point of junction with the east and west system of fissuring. So far, all the workable deposits have been found in the crushed zone west of the Queen vein, in fissures having a general east and west course, but with varying dips, and all of them apparently emanating from the Queen vein.

The principal properties opened in the District and provided with milling facilities are: The Silver Creek Mining and Milling Group; Confidence; Maud S.; Deepdown; Little Fannie-Champion; Last Chance; and the Deadwood group.

With the exception of the last named, which is a new mine, all the above mentioned properties have been through the various vicissitudes of most mining camps situated so remote from cheap transportation and cheap fuel and depending mainly on the high-grade ores when operated on a large scale. Mismanagement and ignorance of the proper methods of treatment played their part also and, while the total output of the camp has reached several millions, the Last Chance mine and the Little Fannie-Champion are the only two which have not been entirely closed down and practically abandoned.

Last Chance Mine.

Until the summer of 1908 the Last Chance mine was really the only producing property in the district, and it is still the largest individual producer of gold and silver in the whole Territory of New Mexico, its yield being nearly half a million dollars a year.

At present the most active operations in the camp are being carried on by the Socorro Mines, a strong financial corporation which has acquired the Little Fan-

nie, Champion and Consolidated groups of claims, and is now pushing the development of these properties with the utmost energy.

To appreciate the reason for the apparent decay of the rest of the camp so soon after its discovery, and notwithstanding its large initial production of silver and gold, the history of the Last Chance mine will be useful.

It dates back about 17 years, when the strong outcroppings were discovered and the locations made. The ores were found to consist of quartz and calcite carrying gold, silver sulphides, traces of copper and lead, and iron pyrites. Some of this surface rich ore was shipped and milled at the old Sheridan mill in Cooney cañon. The property was sold to a Nebraska company under whose management the mine was really opened and a 20-stamp mill with Boss process pan-amalgamation was erected. The records show that this company mined and milled about 10,000 tons of ore averaging by assay $10 per ton, but only yielding by pan-amalgamation $53,000. These disappointing returns resulted in closing down the plant. Later on a bond and lease on the property was taken by the superintendent and some local miners, who did considerable prospecting, and made a further run of several thousand tons with similarly disappointing results. The property was then closed down and remained idle about 8 years.

In 1899 an English mining engineer, E. Craig, examined the properties and, bringing to bear the experience he had gained in other parts of the west on similar ores, took a bond and lease on the property and commenced milling the ores produced from the development of the mine in depth. He soon satisfied himself of two facts: That the ores were gradually but surely increasing in richness as greater depth was attained, and that no form of pan-amalgamation would ever be made to yield over 60 per cent. of the assay value of these refractory ores.

By the installation of concentrating machinery he soon proved that he could extract practically the same percentage at a much less cost in his concentrates, and then the question of the further treatment of the resulting tailings was all that remained to be solved. At that date, the extraction of silver from a sulphide ore by cyanide was still an unsolved problem, and the establishment of a plant for this process was pioneer work. How correct his judgment was, is demonstrated by the remarkable results he obtained after two years of experimenting.

The mine development during this period had been continued to a depth of over 1000 ft., and the average value of the ores had increased from the original $10 per ton to over $18 per ton. At the present time the mill is treating about 60 tons of ore per day and obtaining an extraction of over 89 per cent.

Fuel.

The chief drawbacks to the whole Mogollon mining field are, the high cost of fuel, and the scarcity of water for milling purposes. Situated, as it is, within the limits of the Gila forest reserve, it is not likely that the price of wood (the only fuel available) will be lowered. The restrictions regarding the cutting of cord wood are becoming so onerous, that it will not be long before its use for fuel will become prohibitive. Stumpage has been raised during the last few years from 15c. to 50c. and even in some cases to 75c. per cord, so that wood delivered at the mills in Silver creek cañon costs from $7 to $9 a cord, depending on their location.

Water Supply.

The only water supply available, outside of the small amount pumped from

MONK'S HEAD ROCK

the mines, is obtained from Silver creek and its branches and for four months each year this creek is practically dry. It is evident therefore that the Mogollons is by no means a poor man's camp. But notwithstanding all these drawbacks, the extent of the known orebodies and their great uniformity throughout the district are bound to make it a successful one. Water for milling purposes can be obtained from higher up in the mountains, and Whitewater river, running almost parallel, and south of Silver creek, is a stream of sufficient volume to generate along its course a very appreciable amount of cheap power.

Socorro Mines

Having these points well in view, two of the early pioneers of the district, Messrs. Cooney and Weatherby optioned the Little Fannie, Champion and Consolidated properties. They then located and preëmpted water rights and mill sites on Whitewater creek, which will yield about 800 h.p. They also purchased a ranch higher up in the range, on which large springs had been developed. After several years of hard work, gathering all these essentials together, they disposed of their properties to a company known as Socorro Mines, which is now actively at work developing these resources and putting into effect the comprehensive scheme devised by Messrs. Cooney and Weatherby.

The mining properties owned by Socorro Mines are generally conceded to be the best in the camp. The Little Fannie and Champion are on an east and west vein more or less parallel to that of the Last Chance, while the Consolidated group is on the north and south Queen vein, into which the Champion is expected to merge. The principal work has been and continues to be on the Fannie location, where the vein has been opened to a depth of 500 ft., and over a length of 1250 ft. The average width of the vein down to the 300-ft. level is about 6½ ft.; but on the 500-ft. level the width has increased to nearly 30 ft. in places, the average being probably 10 feet.

The same gradual increase in gold and silver contents, as determined in the Last Chance mine, is also apparent in the Fannie. From the surface down to the 200-ft. level the average (at the present low price of silver) is about $10 a ton; at the 500-ft. level the average will be from $15 to $17 a ton, with bunches in it between $35 and $40.

Equipment

The amount of preliminary work required to put these properties on a producing basis, has been very extensive, entailing not only the ordinary mine development and mill construction, but in addition the installation of the electric generating plant for the utilization of the water power on Whitewater creek, together with the transmission line across the mountains, and the laying of a four-mile water supply pipe from the ranch in the mountains to the mill site. It also meant the building of a new village for the accommodation of the workmen; over two miles of mountain railroad to connect the different mines with the new mill; the opening of a limestone quarry and building of a lime kiln; and the construction of many miles of mountain roads over which to transport the heavy machinery. The entire plant now approaching completion was only started last August. The main three-compartment shaft was sunk to the 500-ft. level by the former owners, but the present equipment of hoisting engine, cages, and air compressor, all operated by electricity, is new.

Mill.

The mill now being constructed will have an initial capacity of 150 tons per day, and is so arranged as to be extended from time to time as necessity may require, without interfering with its operation. The treatment will be by concentration and cyaniding. The ore is delivered to the crusher direct from the shaft. From the crusher it is conveyed by belt to a Vezin automatic sampler; and thence, also by belt, is distributed over the ore bins. The rejections from the sampling mill are elevated and returned to the original ore in the bins. The stamps, of which there are thirty, 1050 lb. each, crush to 20 mesh, and the pulp, after dewatering, flows to six Wilfley concentrators. It is intended to make a product on these machines having a value of from $750 to $900 a ton, but not to make very clean tails.

The tails from the concentrators flow into two Dorr classifiers which separate the slimes from the coarser sands. These latter are fed to two tube mills for regrinding. The oversize from the mills is returned to the Dorr classifiers while the slimes are fed to the slime treatment tanks, and thence direct to two Burt pressure filters. The treatment tanks are of the Pachuca type, with air agitation. The zinc boxes are of the improved El Oro type, and the precipitates will be melted and refined in an oil-burning Harvey-Steele tilting furnace. The tailings from the filters will be discharged and handled by a stacker instead of being flushed out by water. The ore will be stamped in cyanide solution, and every care taken to reduce the consumption of water to the very lowest possible point. The plant also has a very well equipped machine shop, and blacksmith shop; assay office and general store room.

The Power Plant

The main feature is the introduction of cheap electric power instead of steam for the operation of the entire plant. The power generating plant is situated on Whitewater creek and when fully completed will have a capacity of over 800 h.p. The plans contemplate the installation of a dam across the creek about 14,000 ft. above the site of the power plant. The water will be conveyed through a 30-in. steel pipe the effectual head being 555 ft. As considerable variation in the amount of water available is naturally to be expected, the generating machinery has been put in in two units, and a supplementary steam plant erected to be used during the times of low water. There are two 300-kw. generators, each direct connected to a Pelton wheel, and so far one of these generators is belt connected to a Ball, high-speed, compound engine, of 400 h.p. Steam is supplied from two 400-h.p. boilers of the Babcock & Wilcox type, thus insuring power enough for a second engine in case it should be found necessary to further increase the installation.

At present the auxiliary steam plant, only, is in service, the hydraulic part of the system not being yet completed. The current is alternating, 60-cycle, 2300 volts to the transformers and reduced to 440 volts on the distributing lines for power and 220 volts for the lighting system. The construction of the dam, and laying of the pipe to the power plant will not be undertaken till the low water period this summer.

The construction work by the Socorro Mines has been carried through with remarkable energy and rapidity considering all the difficulties they had to encounter. Five miles of heavy mountain road, blasted out of the solid rock, had to be built before any machinery could be delivered at the power plant. Every piece of machinery, and supplies of all kinds had to be hauled in 90 miles from Silver City. From the middle of July, 1908, when the work was inaugurated, till the middle of April, 1909, over 1600 tons of freight had been hauled. Grading for the power plant commenced only in October, and the plant started running April 7.

With the reopening of these mines, a new era of prosperity seems assured for the Mogollons. The pioneer work done on the Last Chance mine has shown what can be done with these ores and the introduction of cheap power by the Socorro Mines, an example that the other mines in the district will have to follow, will enable the utilization of the large deposits of low-grade ore known to exist in the camp, but which could not be profitably treated under the old methods.

Sulphate of Ammonia in Great Britain

The report of the British Alkali Commissioner gives the production of sulphate of ammonia in Great Britain for two years as follows, in long tons:

From	1908.	1909.	Changes.
Gas works	165,474	165,218	D. 256
Iron works	21,024	18,131	D. 2,893
Shale oil works	51,338	53,628	I. 2,290
Coke ovens	53,572	64,227	I. 10,655
Producer gas and carbonizing works	21,873	24,024	I. 2,151
Total	313,281	325,228	I. 11,947

While the gasworks continue the largest source of supply there was an important increase last year from the coke ovens, owing to the greater number of by-product ovens in use. The decrease from iron furnaces was due to the smaller number of furnaces in blast in Scotland, where alone raw coal is used in making iron.

Alluvial gold ground has been discovered (*Queen. Gov. Min. Journ.*, May 15, 1909), near Einasleigh, in Northern Queensland, and a rush has started for the field.

The Manufacture of Nitric Acid from Air*

At a recent meeting of the Association of Austrian Chemists, Dr. F. Russ, of Vienna, described the process employed by the Salpetersäure-Industrie Gesellschaft, for the production of nitric acid from air. All the practical processes may be divided into three classes: (1) Processes making use of disrupted discharges (such as the Bradley and Lovejoy process). (2) Processes utilizing a "moving arc." The motion may be produced either mechanically, or by the aid of a magnetic field (Birkeland and Eyde). (3) Processes based on the use of stable arcs (Badische Anilin und Soda Fabrik, Schönherr's process).

The process of the Salpetersäure-Industrie Gesellschaft is of the second type, the change in the position of the arc being produced by mechanical means. This process is in use in a plant at Patsch in Tyrol, and was worked out by Pauling. The electrodes are stationary, and hornshaped, diverging at their upper end. They are made of iron, and have a life of 200 hours. The arc first forms at the lower end of the electrodes, where the gap between them is narrowest, and is driven upward along the diverging electrodes by the blast of air which is admitted from below with a high velocity. In this way a permanent arc of about one meter length is obtained, a new arc being formed at the bottom of the electrode once in every half-cycle of the current, to take the place of the arc which has been driven to the upper end of the electrodes, and which there breaks down.

The air fed to the arc is preheated. A separate air blast, introduced at lower pressure, serves to effect the requisite "chilling" of the reaction gases. On a technical scale the process gives a 1.5 per cent. yield of nitric oxide. The plant at Patsch is run by water power obtained from the river Sill, and comprises 24 furnaces. Each furnace has two arcs, and every three furnaces are built together in one block. One man can attend to six furnaces. A mica window in the wall of the furnace renders the interior accessible to observation.

The gases issue at a temperature of 800 deg. C., and their waste heat is utilized for concentrating the nitric acid and nitrite solutions obtained. The plant manufactures 30-, 40- and 60-per cent. nitric acid, and nitrite. The yield is about the same as that claimed by Birkeland and Eyde. At the Patsch works the current is used at 4000 volts, obtained by stepping down from 10,000 volts. The capacity of the plant is 15,000 h.p. Two more factories are in course of erection, one in Milan, the other in Southern France, with a capacity of 10,000 h.p. each.

*Translated from *Zeit. fur Angew. Chem.*, May 7, 1909, No. 19, p. 906.

The Proper Design of Cams

By Mark R. Lamb*

There is a problem in stamp mill construction the answer to which is apparently not known to all mill builders. Some one who does know should write a treatise for machinery manufacturers and call it "Cam design, or Why Cam Shafts Break." Quite a number of mill men believe that cam shafts are broken by one of two causes—either by too light a feed or by loose mortars.

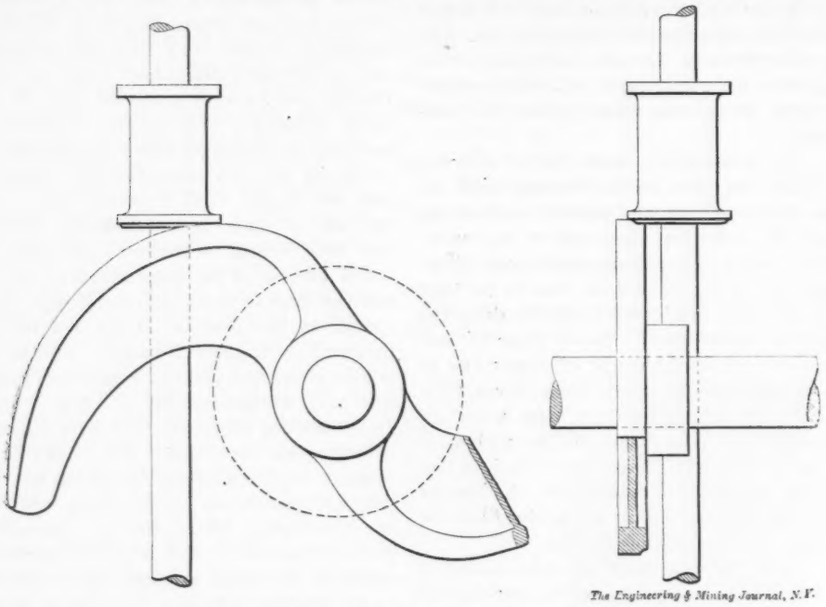


FIG. 1. IMPROPER CAM CONDITIONS IN ONE MILL

The first of the accompanying sketches shows the exact condition of a light stamp battery, which is of course unusual but which makes the first point clear. The cam was actually on the wrong side of the stem and the cam shaft was set so far away from the stamp that the cam lifted the tappet at its edge and with only part of the face of the cam. The result was that the edges of both the cam and the tappet were rounded off smoothly, while the guides were badly worn after only a short run.

Important Features of Cam Design

The important points in cam design are that the best material should be used so as to get the necessary strength without unduly increasing the weight and hub dimensions, and that the length of cam should be proportioned to the desired length of drop. It would hardly seem to be necessary to call attention to this latter point, yet many mills with 10-inch cams are running with a 6-inch drop. An important point in the erection of the battery is that a vertical line intersecting the line of contact of cam and tappet should be tangent to the inscribing circle of the cam.

*Milling and cyaniding engineer, Allis-Chalmers Company, Milwaukee, Wis.

Between the condition of the mill shown in Fig. 2 and a proper arrangement are all grades of cam conditions.

Regarding the use of a long cam for a short drop and an unnecessarily massive hub there should be no room for discussion. An old battery-man will admit that his mill is noisy (and may say that he contemplates putting leather on his tappet faces) but he would be really surprised to note the difference in noise in his mill, as compared with a mill with proper cams, properly used. He would not admit that his cams raised the stamps by a series of blows rather than by a continuous push, yet many cams are operating in just this way.

It is easy to arrange an indicator to draw diagrams which will plainly show the facts. I have in mind a 40-stamp mill provided with 9.5-inch. cams used for a 6-in. drop of stamp. The length of cam governs its curve, of course, but should also govern the speed at which it runs. In this case the cam shaft turns 55 r.p.m. and the stamp stems are lifted with two or three terrific blows of the cam—the first blow at a velocity of 90 ft. per min. instead of half that, if the cam had been designed for a 6-in. drop and could begin its lift close to the hub. And the smaller the hub the smaller the inscribing circle can be made, with a consequent reduction in starting speed of the stamp.

Further, if this 9.5-in. cam were used for a 9-in. drop as intended, the speed of the cam shaft would be less with still lower starting velocity for the tappet. The strain on all parts of a battery is much increased when the drop is shortened (while using a long cam) as, for example, when the battery is overfed; and tappets, bossheads and shoes are much more liable to loosen than at other times. At such times the cam strikes the tappet with double the velocity during normal operation. Indeed, in a properly operated mill, it is possible to detect one such overfed battery in a 100-stamp mill, merely by the sound.

Crystallization of Cam Shafts

As an example of proper cam construction and battery operation, one of the Homestake mills suits my particular ideas best. The space between the tappet and the cam, at the instant the stamp comes to rest, would not accommodate a lead-pencil. There is no unnecessary loss of time between this instant and the engagement of the tappet by the cam. This 300-stamp mill is not nearly so noisy as the 40 stamps above mentioned, and the noise

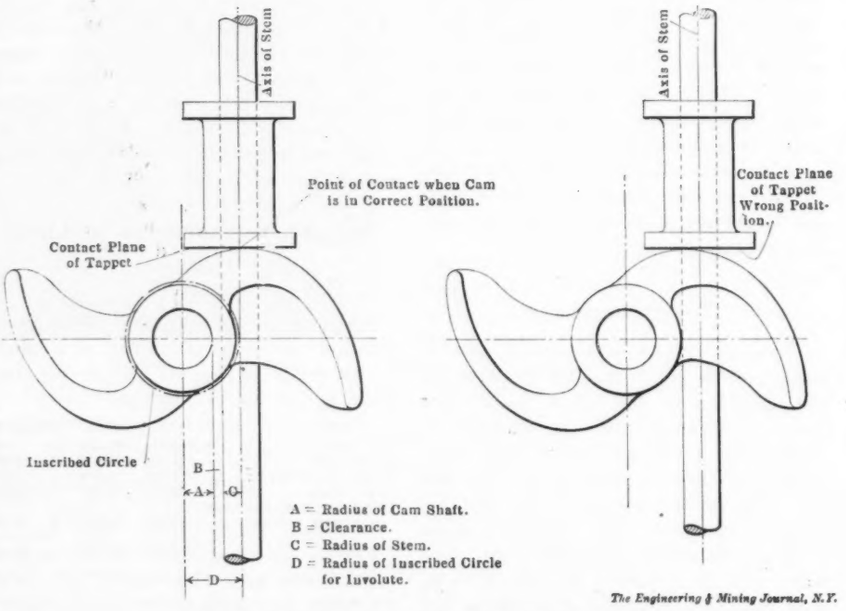


FIG. 2. CORRECT AND INCORRECT POSITION OF CAM

might be taken as an index of the relative troubles experienced. These unnecessarily heavy blows are what cause the so-called crystallization. This crystallization, like "rusty gold," is charged with much which should be blamed to ignorance. The "crystallized" cam shaft, if examined after breaking will generally be found to have cracks started, other than the one which caused the rupture.

When cams are provided with fasteners which require holes in the shaft, quite a few of these holes will show a crack starting both ways around the shaft. When ordinary keys are used, similar cracks will start from the corners of the keyseat. The crystallization of stamp stems amounts to the same thing. A stem broken near the bosshead generally shows a multitude of fine cracks around the lower end and for several inches up the stem. For this reason, after the stem is broken once, it breaks with comparative frequency thereafter unless the lower several inches are cut off, since merely pointing the end in a forge or lathe does not remove these cracks. The design of mill using extra long bossheads and low-set lower guides prevents to a large extent the constant strain on the stem near its point and to this extent is to be preferred to the usual construction.

A cam shaft under the improper conditions above mentioned has not an instant of peace, and is either bending to a blow or recovering therefrom hundreds of times per minute. The size of cam shaft is out of all proportion to the actual foot-pounds transmitted and must be so in order to resist the unavoidable blow of starting the stamp upwards, even when this blow is made as light as possible. The actual strain due to lifting the stamp is relatively unimportant as compared with the strain of the instant of starting the stamp. The aim should be, then, to have as small a hub as possible, consistent with proper strength, a cam designed for the desired lift and a practically vertical lift of the stamp. Thus would the strain on the cam shaft be reduced, and the size of the shaft could be reduced, which would in turn reduce the starting velocity of the stamp.

Accessory Strains

All these strains are transmitted by the cam shaft through bearings and battery posts to foundations. In one new mill the frame is going to pieces for no other apparent reason than can be found in these excessive, undue strains. The foundation is of concrete and the battery posts are provided with bolts which under ordinary circumstances would be considered amply large, yet these latter break continually, and there seems to be no way to hold the posts to their bearings. The cams are unusually long and seem to be of ordinarily good material, and on account of soft ore the drop is short. The mill is worse than a boiler-shop for noise and the cams are already battered flat at a point about half way of their length, at which point the tappet is caught. The pile of broken cams is quite large, with occasional cam shafts showing through it. The tappets have three keys but slip frequently though keys are driven to the limit with a sledge.

Valuable information should be obtainable from steel and iron manufacturers regarding the relative value of iron and steel as material for cam shafts. The consensus of opinion among those who have the pleasant job of changing broken shafts, is that iron is better than steel for the same reason that copper would be better than glass. The glass and steel are much more rigid, yet would break more quickly. Wrought iron seems to be the favorite, though when this is ordered soft steel is often furnished instead. It is difficult to distinguish between these materials when the shafts are new and bright, but a slight coating of rust reveals the irregular grain of the iron and will sometimes reveal the welded cam shaft which is occasionally furnished.

This question of material of cam shafts is of at least equal importance with discussions of comparative efficiencies of the various sequences of drop. As the latter is largely a matter of opinion and screen size, as well as of the characteristics of the ore and the battery-man, the discussion can easily get top-heavy. For example, not long ago a learned paper was read comparing the efficiencies of the several drops and giving the scientific reasons for same; and the relative merits of 1-4-2-3-5 and 1-5-2-4-3 were gravely compared, though these two sequences are exactly the same. Similarly, I have recently seen a letter in which the writer asks, in all seriousness, for the best drop for a 3-stamp battery, and there is only one possible drop.

Some remarkable specimens of zinc blende are furnished by the Calumet & Sonora mine near Cananea, Sonora. Specimens of this blende show wonderfully distinct crystal and cleavage faces. In appearance it somewhat resembles smoky quartz, interspersed by streaks of brilliant amber yellow. A specimen 1 in. thick is so transparent that objects half a mile distant may be discerned through it on a murky day.

The total 1908 production of zinc oxide, in the United States, including a small quantity made from spelter, was 65,100 short tons worth $5,876,342, as compared to 85,390 short tons worth $7,731,100 in 1907. These figures are from statistics of The Mineral Industry.

Only 1,600,000 lb. of antimony worth about $4,095,000 were produced in the United States in 1908.

St. John Del Rey, Ltd.

Special Correspondence

The seventy-eighth annual report of this British company operating a Brazilian gold mine, deals with the financial year ended Feb. 28, 1909. The result of the year's working is satisfactory, increased returns over those of the previous year having been obtained. From the Morro Velho and Cuiabá mines, gold to the value of £370,201 was produced, which, after deducting gold charges, realized £357,585. Excluding a small amount of gold won from what is classified as low-grade material, the average recovery from the 170,200 tons of ordinary ore crushed realized $9.96 per ton. Working costs are given at £236,442, or $6.665 per ton, classified as follows: Mine department, $2.975 per ton crushed; reduction, $2.35; mechanics and general, $1.34. The balance of profit from the Morro Velho Estate working account shows a credit of $88,595. The preference shareholders received the usual 10 per cent. dividend, while the ordinary shareholders received 1s. 2d. per share for the year, as compared with 1s. in the previous year. The directors transfer a considerable sum from the profits, meeting new capital expenditure, this policy commending itself to them rather than that of issuing fresh shares.

Reference is made to some experiments with an electric furnace for converting the company's iron into steel at a cost below the price of imported steel. The power required to generate the electric current is, however, more than can be spared by the requirements of the mine. The directors quote a paragraph from the message to the National Congress sent last May by the President of the Republic of Brazil, which is as follows: "The center of Minas Geraes, between the cities of Queluz, Marianna, Itaoira and Sabara, may be considered eminetly the ironfield of Brazil, and its area has been computed at 11,580 square kilometers. Both for extent and quality this may be counted among the richest of the world's deposits."

The report of the superintendent, G. Chalmers is, as in former years, an exhaustive review of the company's position, giving full particulars of what has been done and what is proposed for the future. It is no mere string of technical statistics, such as is so frequently the case in the reports of many important mining companies. The report given by Mr. Chalmers is of general interest and one that can be followed and understood by anyone and it is not necessary to have technical or mining knowledge to master its contents. The great depth to which mining has reached—now over 4000 ft. from surface—and the absence of a good shaft calls for special attention to the provision of adequate ventilation. Mr. Chalmers' re-

marks on this subject are of exceptional interest, containing statistics of rock temperatures and observations on the limits of deep mining generally. It may, however, be noticed here that mining to a depth of 6500 ft. is contemplated, a depth at which mining can be carried on if sufficient artificial ventilation is provided.

On the subject of the sanitary condition of the mine Mr. Chalmers laments the uncleanly habits of the miners and their refusal to make use of the dust protectors and water-spray apparatus, which are provided. In consequence of this recklessness pneumonia and lung diseases are much more common than they should be. There have been seven fatal accidents during the year from "blistering" stone. The "blistering" is due to the great pressure that the rock is under. Danger from this source can, however, be largely avoided by leaving the stopes for a few days until the "blistering" is over, but this calls for a large number of working places, or in other words, increased development. The accident rate is high also on account of the poor labor available. The force of skilled miners is small and the greater number of men employed are badly fed agricultural laborers.

As regards the condition of the mine horizon 15, the deepest at present, has been better than horizon 14, and on this account the explorations of horizons 16 and 17 are looked forward to with much interest. The ore reserves are given at over 1,000,000 tons.

As to the life of the mine, it is calculated that if the lode continues in width and value to a depth of 6500 ft., the life at the present rate of mining will be about 18 years. The Morro Velho self-supporting hammer drills have done splendidly when the air pressure was sufficient. Under a pressure of 68 lb. they give high results. It is a pity that more particulars of these drills are not given.

The report contains ample information about the reduction plant and ore treatment, upon which much experimental work has been conducted. The average extraction for the year under review was 91.28 per cent., as against 91.06 in the previous year. The mill is under-powered and it has been a struggle to get the 16,000 tons a month through. Electric power is now largely used, the cost being £2 6s. 6d. per horsepower-year as against nearly £70 for steam. This high cost of steam power has forced the management to look for further water power, and a scheme is proposed for obtaining 1400 e.h.p. from the Rio do Peixe. As the ore contains a large proportion of sulphides, ranging from 36 to 40 per cent., the consumption of cyanide is very heavy, amounting to at least eight times more than on the Rand. Owing to the high cost of steam power the heavy freight rates for transport from the coast and to the inefficient labor, there there is great difficulty in keeping costs low; but it is evident that close attention is being paid to economy and that the management is in capable hands.

An All Slime Cyanide Plant at Guanajuato, Mexico

By Edwin Shapley*

The first all-slime plant in the Guanajuato district has been built and placed in operation by the Santa Natalia Mining and Milling Company. In this plant there are but two pumps used, one for lifting the water from the river and the other, a small centrifugal used for pumping precipitates from sump to filter press. All return solutions, sands, etc., are elevated by air lifts, which require no attention nor repairs, and the air consumption is exceedingly low.

The ore is brought down to the mill by a gravity tramway, the cars running over the bin and discharging onto a grizzly, the oversize going to a Blake crusher and then to the bins. From the bins it is fed to ten 1050-lb. stamps which crush through a 10-mesh screen in a 0.02 per cent. cyanide solution. The stamps drop 7½ in. 106 times per min., and crush five tons per stamp per 24 hours. Forty-five per cent. of the battery-screen sample will pass a 200-mesh screen. From the batteries the pulp is run to a cone classifier; the overflow, all of which passes 200 mesh, is run directly to treatment tanks; the underflow from this cone is fed directly to a tube mill. The discharge of the tube mill shows that 55 per cent. passes 200 mesh. This product from the tube mill is fed by gravity to another cone classifier, the overflow of which passes 200 mesh and is fed direct to treatment tanks; the underflow is returned to tube mill for regrinding by means of an air lift, notwithstanding the fact that this pulp is quite thick, about two of water to one of sand, and that it has to be lifted 13 ft. vertically. This air lift has not required one minute's attention since the plant started three months ago.

Operation of Treatment Tanks

Pulp is thickened in the treatment tanks, the solution being constantly decanted to the sump tank while the charging is going on, and being lifted to the mill tank, by air lift, to be used in the batteries again. When this solution is found to contain much gold or silver on account of the extraction that takes place in the mortars, it is run through the zinc boxes. The tanks are charged for 24 hours with a charge of 50 tons.

The treatment tanks are 20 ft. in diameter and 10 ft. high, and are cone bottomed, the cone part having an angle of 50 deg. A flange is placed at the bottom of the cone to which is fitted a 10-in. cross; to this cross is connected a 10-in. pipe extending far enough horizontally to clear the vertical sides of the tank, another pipe of equal diameter being connected to this horizontal pipe by means of a T. This pipe extends vertically so as to come about one foot above the top of the sides of the tank. A 4 ft. length of pipe is then connected horizontally so as to throw the pulp into the tank. This is also connected by a T, as when the tanks are charged, the pulp is run directly into the vertical pipe and passes down and through the horizontal pipe at the bottom into the tank. In this way the tanks are charged from the bottom and there is always clear solution on top of the pulp to decant while the tank is charging. A ¼-in. hole is tapped at the bottom of the vertical pipe for the introduction of the air. When the air is turned on it causes the pulp to be forced up through the 10-in. pipe and discharged into the top of the tank, coming out with enough force to discharge half way across the top of the tank, with the full capacity of the pipe. As the pulp is constantly being drawn from the bottom of the cone and discharged into the top of the tank, it is thoroughly and constantly aërated.

The pulp is given 10 hours agitation on the first wash, and six hours on the second and third; the fourth and last wash is water. The solution is decanted from tanks to filters and then lifted by air lift to a storage tank and run by gravity to zinc boxes.

The tube mill used is 20x3½ ft. and is run by a 20-h.p. motor. A mill of this proportion was selected on account of the fact that it requires less power to run than one of greater diameter and less length. Judging from the work it is doing, its efficiency is as great as that of other-style mills.

The ore from the mine averages 15 grams gold and 300 grams silver per ton. The extraction, being figured on the actual recovery in bullion, is 87 per cent. of the silver and 98 per cent. of the gold contents of the ore.

*Mining engineer, Apartado No. 87, Guanajuato, Mex.

The production of petroleum in Mexico in 1908 was about 4,000,000 bbl., compared to 2,000,000 bbl. in 1907.

A bonus of 4d. per lb. will be paid on the first 100,000 lb. of marketable retorted quicksilver produced in New Zealand (*New Zealand Mines Record*, April 16, 1909). Certain conditions are specified.

The United States production of pyrite in 1908, according to reports collected for The Mineral Industry, decreased to 206,471 long tons ($744,463) from the 1907 figure of 261,871 long tons ($851,463). A number of the smaller companies failed to operate.

Problems of the Russian Oil Industry

By Frank Richards*

I have recently had some interesting correspondence with A. Mancho, managing director of the Bibi-Eybat Petroleum Company, Limited, Baku, Russia. I am not only at full liberty to use the information thus conveyed, but it is desired that the problems presented may be brought to the attention of engineers for discussion. The matter which I have collected is taken from the correspondence referred to and also from a report prepared by Mr. Mancho for the Technical Commission for the Preservation of the Baku Oilfield. Baku is in Transcaucasia, at the southeastern corner of European Russia. The town of this name is situated on the west shore of the Caspian Sea. The remarkable escape of natural gas in the neighborhood, which became ignited and blazed for centuries, made this section a great resort for fire worshippers.

Oil Raised by Buckets

The oil wells in the government of Baku are not flowing wells, nor are they pumped by any device customary in the American oilfields. The oil is raised by buckets, using steam for the hoisting, and burning a portion of the oil under the boilers for generating this steam. The problem now arises as to the employment of a more economical system. A falling off in the output of the oil wells, especially in the Bibi-Eybat section, has taken place lately, notwithstanding the repeated deepening of the wells and the increased expense thereby involved.

The cost of labor, machinery, materials, etc., having also increased, many producers have been compelled to discontinue work. There has also been additional discouragement in the low price of crude oil, and a belief that a substantial improvement in the near future is out of the question. During the last half of 1908 general reductions in operations have been taking place, with the conviction that worse conditions are in store.

In view of these circumstances the producers naturally have turned their attention to the oil they are using for fuel. This, according to official statistics, reaches the extraordinary amount of 15 or 16 per cent. of the total output. My correspondent says that the actual figures are higher, as some firms are keeping back the correct figures on account of the large quantity of oil so used. A boiler of the ordinary type, for instance, is usually said to require 100 to 150 poods—a pood is 36 lb.—of oil per day, whereas the average is probably 200 poods at the very best, and in cases of emergency the figures rise to 250 poods per day.

During the last year much has been done by some producers with a view of economizing steam power and reducing the consumption of fuel; but on account of the reduced output of the individual wells all that could be done in most cases was to keep the percentage at the former rates. In fact, there is a further increase in the fuel rate to be feared, and an entire cessation of work on some wells is not improbable.

Utilizing the Natural Gas

Many of the baling wells produce large quantities of combustible gases which at present simply go to waste. Up to 1907 attention was occasionally called to this fact in a casual way, but the opinion prevailed that the wells not being covered, it would be impossible to get the gas in sufficient quantities to make its use for fuel a commercial success. In the summer of 1907, however, the Bibi-Eybat Petroleum Company, Limited, connected several wells with a boiler by means of an exhauster.

The experiment showed that notwithstanding the light pressure of the mixture of gas and air—about 100 to 120 mm. of water—it was possible to generate steam in the boiler equal to about two-thirds of the horsepower produced with oil fuel. The possibility of the commercial utilization of the gases from the baling wells not being proved, the necessary pressure as well as the capacity of the gas exhauster were ascertained and eventually the Bibi-Eybat Petroleum Company proceeded to instal a complete plant for the purpose of burning these gases under the boilers.

In December, 1907, the members of the Technical Commission, who were in the neighborhood inspecting the route of a proposed fresh-water pipe line, were given an opportunity to see 10 boilers at work on a plat where 17 wells were in production. Five of these boilers were fired with oil and five with gas, which was drawn from seven of the wells. Thus in the quantity of oil used for fuel a considerable saving will be effected.

In this particular case the saving of oil to the company is 1000 to 1200 poods per day; but according to the forecast of the Association of Oil Producers (Ssoviet Ssyesda) for the year 1909, the total consumption of oil for fuel will amount to about 70,000,000 poods. Supposing the substitution of gas for fuel would reduce this figure by 20,000,000 poods, this quantity thus brought on the market would in some measure make up for the inevitable decline in production.

Unfavorable Leasehold Conditions

The conditions of leasehold of government lands are not such as offer much inducement to economical operations. According to the contracts, the oil used for fuel is free from any charge (royalty, etc.), and paying, as the operators do, 40 to 50 per cent. of their net output to the government, every pood saved would be subject to the same tax. The remaining 50 to 60 per cent. would be such a comparatively insignificant gain, that considering the high rate of money and the indisputable decline in the production of the Bibi-Eybat oilfield, the utilization of gas is not of much interest from a commercial point of view.

This is the view of the situation as it is generally accepted; at the same time, Mr. Mancho states in his report that the rapid decline of these oil-bearing properties and the falling off in the output point to the conclusion that, merely from the standpoint of the political economist, attention must be given to the fact that a large amount of combustible material is continually going to absolute waste, whereas if it were properly captured and utilized millions of poods of oil would become available for the market, and of consequent benefit to the country. It has been suggested, therefore, in his report that the government, for reasons of state, can and ought to waive its claim on any saving effected by the producers in using gas for fuel in place of oil.

The use of gas would not necessitate any important alterations to the boilers now adapted for the use of oil. To hang up the oil burners when the gas burners were in action, and *vice versa*, would be all that would be required, and not more than two or three minutes would be needed for either operation. Mr. Mancho with suitable apparatus conducted investigations, the result of which were not embodied in the above report. The mixture drawn from the wells contained from 30 to 70 per cent. of air, also a certain percentage of moisture.

The products of condensation of the oil gases, as ascertained by analyses of samples taken from the gas mains, showed the following characteristics: Specific gravity at 15 deg. C., 0.837 to 0.811; evaporation at 100 deg. C., practically nil; at 240 deg. C., about 92 per cent.; residue amounted to 7.9 per cent. in one case and 10.4 per cent. in another; in one sample sulphur was present.

Under conditions varying so greatly it was found extremely difficult to ascertain the precise power or fuel value of the gas as drawn from the well, and it was in the quest for additional apparatus that I was consulted. The obvious suggestion was volunteered that the gas should not be used as fuel for steam boilers, but rather to develop power directly in gas engines, with presumably a resultant saving of all the oil for commercial purposes. The answer which this suggestion elicited is interesting, and shows other difficulties of the case. It proceeds as follows:

Use of Gas Engines

"Regarding your remark as to substi-

*Engineer, 229 West One hundred and thirty-fifth street, New York City.

tuting gas engines for steam engines, I may say that the same idea has occurred to ourselves. The difficulty lies in the fact that we possess complete and extensive steam plants which would have to be disposed of for almost nothing, and that the installation of a gas plant would mean a large capital outlay. A gas engine would be required for every individual well, which would scarcely be compatible with our mining regulations which provide, with a view to minimizing the risk of fire, that such engines shall be situated at a distance of not less than 70 ft. from the center of any well, oil tank, etc. This would be too great an encroachment upon our available space.

"Neither do I suppose that such engines, generally speaking, could receive the same careful handling here as would no doubt be the case on your side of the water. It must further be considered that fierce winds prevail in our part of the country, which is almost devoid of vegetation and instead covered with loose sand. Every gust of wind raises a cloud of fine dust, which getting on the piston of the engine would soon destroy the air-tightness which is so essential a condition for gas motors.

"Moreover, the cost of the gas engines which are mostly imported would be so greatly in excess of the cost of our locally built steam boilers and engines that the advantages resulting from the use of gas motors here would not leave so large a margin of profit as they probably do in America. Nevertheless, even under the conditions as mentioned, gas engines are gaining more and more ground in Baku.

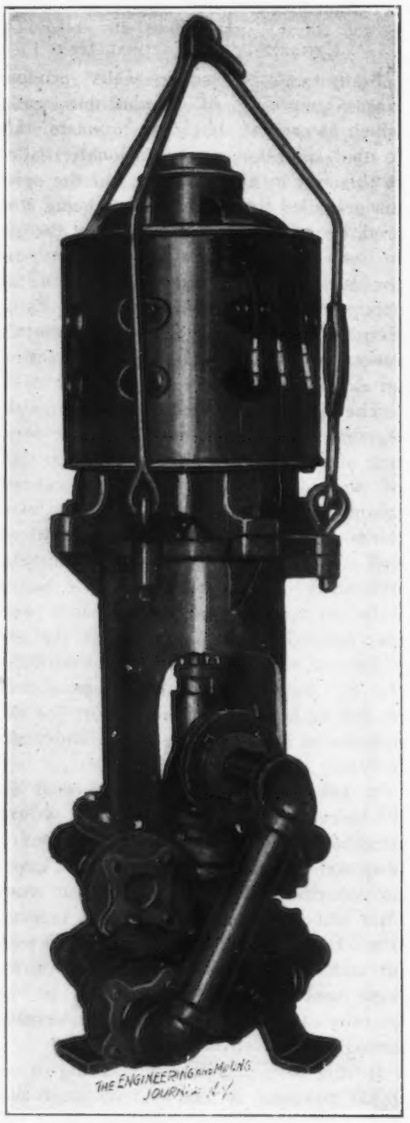
"Regarding the chief issue of the question dealt with in my report, it remains the same as far as the ownership of the oil-bearing lands is concerned, whether gas engines are used or not. The government leases the land on the condition that 40 per cent. of the net output goes to the government, the assumption being that the necessary power will be supplied by steam, in view of which all oil used as fuel is exempt from any charge. It is in this respect that the situation remains unchanged, the 40 per cent. clause applying as hitherto to the whole net output. In other words, in the saving effected by using gas engines instead of oil as at present we would benefit only to the extent of 60 per cent. To have this restriction removed is of paramount importance to our industry."

During the 14 years preceding the Courrières mine disaster in 1906, (*Engineering News,* April 29, 1909) there was not a mine explosion in France in which there were more than nine men killed; in the Courrières explosion nearly 1200 men were killed.

The exportation of bar copper from Argentina in 1908 was 224 long tons; of copper ore, 2800 tons.

Unusual Centrifugal Pump

The accompanying cut shows a 2½-in. compound-vertical shaft sinking pump, driven by a 20-h.p. motor, designed to handle from 120 to 180 gal. per min. against varying heads up to 225 ft. The pump is equipped with bronze runners, each made in two pieces, brass glands, forged steel shaft and cast-iron casings and side plates. The action of the thrust



ELECTRICAL SINKING PUMP

is balanced, the pump suction inlet being at the bottom of the lower or first stage while the inlet for the second stage from the first is above at the top of the upper casing. The thrust bearing on the motor was built sufficiently heavy to bear the weight not only of the motor rotor but also of the moving parts of the pump, the shafts being connected only by flange coupling, each half being held securely to shaft by taper pin.

When in place in the mine shaft the motor is protected from stones dropping down by a circular conical baffle or deflector made of ¼-in. boiler plate and slung below the ring on the three rods supporting the pump from the tackle. A similar plate is attached to the bottom of the machine to guide it down the shaft to prevent catching on cross timbers. Water is taken through about 10 ft. of marlin-wound heavy rubber hose connecting with the suction inlet and protected at the lower end by an ample strainer.

The pump construction as shown in the cut weighs without motor 650 lb., with motor 1500 lb., and was recently shipped to a foreign customer by the Buffalo Steam Pump Company, of Buffalo, N. Y.

Dominion Iron and Steel Company

The annual meeting was held at Montreal June 17. The annual report showed a profit, after payment of all expenses except interest and after setting aside the necessary appropriation for sinking fund, exhaustion of minerals and depreciation of plant, of $2,225,834. Interest charges amounted to $654,422, including interest on floating indebtedness curtailed by litigation, leaving a net surplus of $1,571,412. The payment of $2,750,000 by the Dominion Coal Company in settlement of the damage suit leaves a balance of $1,201,092 still to be adjusted, but of this sum only $392,496 has been taken into account in making up the books to May 31. The directors have taken advantage of the readjustment to appropriate $1,800,000 in reduction of property and construction account—leaving a balance of $2,099,801 to be carried forward to the next year to profit and loss. The report is optimistic as to the business outlook. Frank Merrick, an expert, presents an estimate as to the extent of the company's iron ore areas at Wabana, Newfoundland. The land area is estimated to contain 17,750,000 tons, and the first submarine 90,650,000 tons a total of 108,400,000 tons. The cost of mining at present and within any reasonable time is likely to remain so low that the ore can be mined to yield a handsome profit, either by converting it into pig iron or selling it in the open market. The shareholders authorized a new issue of $20,000,000 consolidated mortgage bonds.

Production for the fiscal year ended May 31 was as follows, in long tons:

	1907-8.	1908-9.	Changes.
Pig iron	282,357	282,051	D. 306
Steel ingots	290,952	284,495	D. 6,457
Blooms	250,377	270,881	I. 20,504
Rails	156,021	134,607	D. 21,414
Wire-rods	45,667	50,554	I. 4,887

At the present time the steel works are running to their full capacity, in all departments.

Statistics of THE MINERAL INDUSTRY show that the output of gypsum for the United States decreased in 1908 as compared with 1907: 1,721,829 short tons ($4,138,560) against 1,751,748 short tons.

Tailings Disposal Plant at the Wolverine Mill

After Being Unwatered in the Smith Separator, the Tailings Are Conveyed 1000 Feet on Robins Balata Belts with Small Power Expenditure

BY C. KEMBLE BALDWIN*

In choosing the location for a stamp mill, two of the determining features are the necessity for an abundance of water and a convenient space for the disposal of the tailings. Because of these considerations, the mills in the Lake Superior country are usually located on some body of water from which the supply may be pumped, the water and sand being discharged back to the lake or river through launders.

Steel launders carrying all of the water, sand and slime from a mill must have a drop of ⅜ in. per ft., therefore the mill must be built on elevated ground to provide for sufficient dumping space, particularly if the sand must be carried any great distance from the shore line. Heavy storms will frequently wash the sand banks down, increasing the available space, but this can hardly be depended upon. In many cases high ground for the mill is not available, and in other cases the dumping space is so filled in that it is necessary to raise the sand and water mechanically to admit of its disposal.

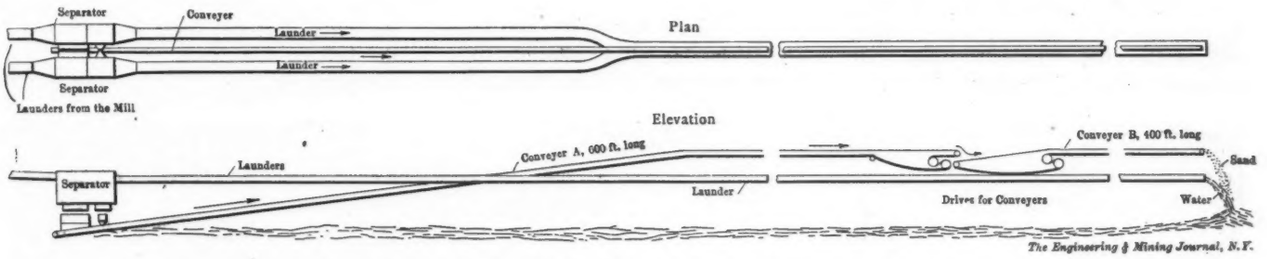
The stamp mills of the Mohawk Mining Company and the Wolverine Copper Mining Company are located at Gay, Michigan, on the shore of Lake Superior. The mills adjoin and are built on an elevation of approximately 37 ft. above the lake level. The ore for the Mohawk mill is hauled about 15 miles from the mines at Mohawk, and that for the Wolverine mill from the mines at Kearsarge, about 17 miles. The standard gage cars are hauled up the inclines at the mills and the ore is discharged into the bins from which the stamps are fed.

The Mohawk Tailings Plant

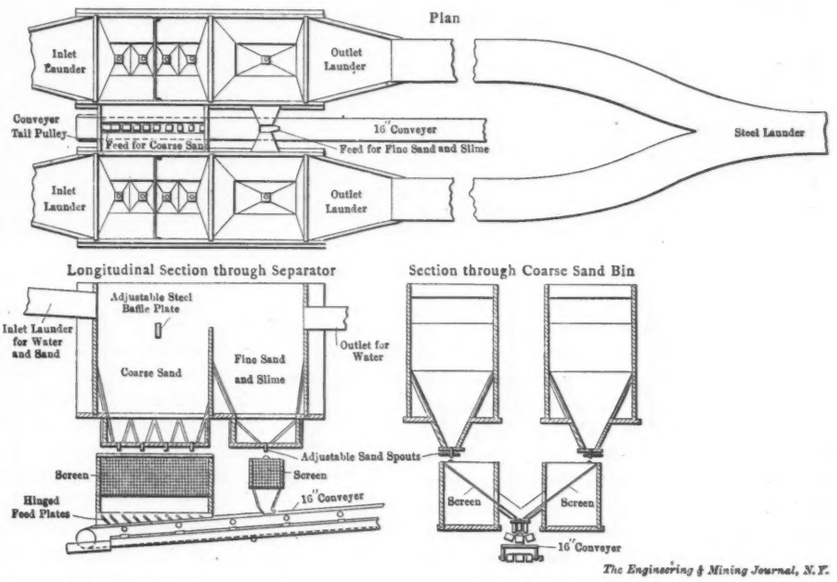
The Mohawk mill, started in 1902, has a capacity of 2800 tons of ore per 24 hours. The mixture of water and sand was originally discharged by launders back to the lake, but about three years ago the space had been so filled up that some method of lifting the material became necessary. After carefully considering the sand wheel, pumps and mechanical elevators, they adopted the suggestion of J. F. Jackson, an engineer, of Houghton, Mich. His scheme consisted of the separation of the sand and water close to the mill.

The material was discharged into a sump by the launders. Four chain and bucket elevators, 13 ft. long, with perforated buckets 25½x14x11½ in., lifted the sand from the sump, the surplus water draining off through the holes in the buckets. The water overflowed from the sump tank to a launder with a drop of 13/16 in. in 10 ft., which carried it 700 ft. toward the lake. The sand from the four elevators (two of them being reserve elevators) was discharged to a horizontal 20-in. belt conveyer 700 ft. long, which I designed. This conveyer ran over the launder in a covered gallery at the end of which the sand and water joined and flowed into the lake.

A 700-ft. launder with a drop of ⅜ in. per ft., carrying all of the sand and water from the mill would have a total drop of 21 ft. 10½ in. When the sand was removed, however, the water would flow in the launders at a drop of 13/16 in. in 10 ft., so that the total drop of the 700-ft. launder was only 4 ft. 8⅞ in.; the discharge point 700 ft. from the mill was, therefore, raised about 17 feet.



TAILINGS DISPOSAL PLANT OF THE WOLVERINE COPPER MINING COMPANY, GAY, MICH.



SAND SEPARATOR AND CONVEYER FEED—WOLVERINE TAILINGS DISPOSAL PLANT

Maintenance Troubles

The installation developed several difficulties. The conveyer was equipped with a high-grade rubber belt, but the load being less than 116 tons per hour, it was more difficult to make the belt run straight than if it had been fully loaded. This, coupled with the fact that the belt was continually soaked in water, caused it soon to show signs of wear on the edges. Rubber belts are waterproof only when

*Chief engineer, Robins New Conveyor Company, Old Colony building, Chicago, Ill.

the cover is intact, as the rubber is applied to the duck in a plastic form, the consistency of putty, so that it coats the surface only and is not absorbed by the duck. When the edges became worn and the duck exposed, the water was absorbed by the duck, causing the rubber to lose its hold and thus the life of the belt was shortened. A more satisfactory belt for this service has been found and will be referred to later.

The chain elevators proved to be expensive to maintain, owing to the sand rapidly cutting out the links, pins, shafts, tumblers and buckets. In spite of these minor difficulties, however, the plant in principle was eminently successful, as it solved the problem of giving additional dumping space at a small operating expense and at a reasonable first cost. Each elevator required about 4½ h.p., the conveyer about 8¼ h.p., and two men looked after the operation on each shift. The launders were of steel, semi-circular, 48 in. in diameter. The gallery was built of timber covered with asbestos board.

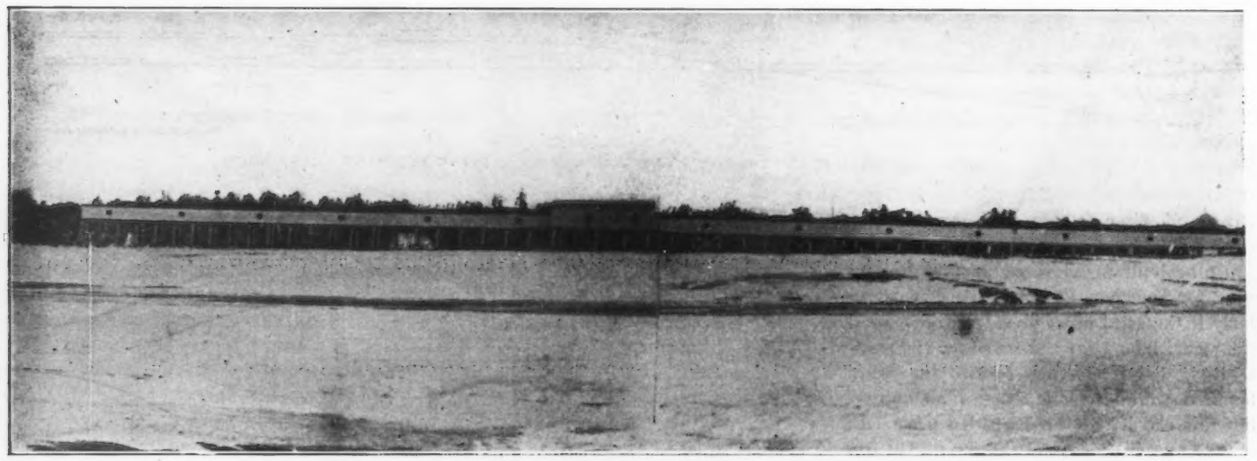
proved the advisability of making the conveyer in two parts, the first section 600 ft. and the second 400 ft. long; the 400-ft. section being designed so it may be extended to 600 ft., making the total distance 1200 feet.

As the stress in the belt fixes the maximum length of the conveyer, it was possible to use narrower and lighter belts by building the conveyers in two sections, thus decreasing the first cost, power and maintenance. It also made it possible to discharge for a considerable period from the end of the first section, filling up the dumping ground at this point. In Fig. 1, the photograph was taken from the lakeside, with the Mohawk mill and its 700-ft. conveyer on the right, and the Wolverine, with its 1000-ft. gallery, on the left. The unwatering apparatus is located in the enlarged portions of the galleries outside the mills proper.

The Unwatering Apparatus

The Wolverine mill handles 960 tons of rock per 24 hours, requiring 8,500,000 gal. surplus water. From the screens the sand with about 15 per cent. of water is fed to the belt conveyer, a series of hinged wing plates directing the material forward. The conveyer runs between the boxes at an incline of 5 deg. until above the level of the launder and then horizontally to the discharge. The launders from the two boxes are merged into one beyond the inclined portion of the conveyer. Fig. 3 shows the arrangement of separators, launders and conveyer.

The discharge openings in the spouts are adjusted so that there is a steady flow of sand from the boxes to the screens. The sand moves slowly down the screens as the conveyer draws its load out of the feeding slot. The feeding is continuous, requiring neither power nor labor. Owing to the tendency of the fine sand and slime to adhere to the belt, the spout from this box is arranged to discharge the material on the stream of coarse sand so the slime does not come in contact with the belt at any time. An attendant is necessary at this point to regulate the



TAILINGS DISPOSAL PLANT OF THE WOLVERINE STAMP MILL, GAY, MICH.

Designing the Wolverine Plant

The operation of the Mohawk plant was carefully studied and the objectionable points noted with a view of building a similar plant for the Wolverine mill. At the direction of Fred Smith, agent of both the Mohawk and the Wolverine companies, a series of experiments was started to unwater the sand without the use of the elevators. These tests, in charge of W. J. Smith, assistant superintendent of the companies, resulted in the production by him of a gravity separator and conveyer feed, which is being made the subject of U. S. and foreign letters patent. This portion of the problem having been successfully solved, I was called in to study the conveyer installation. As the Wolverine mill adjoins the Mohawk, there is practically a common dumping ground. It seemed advisable, therefore, to provide a system which would carry the sands farther into the lake, 1000 to 1200 ft. being decided upon. Calculations of water. The separation of the sand from the water is accomplished by the gravity separator shown in Fig. 2. Two separators, side by side, were installed, although one will handle the product of the mill, the other being held in reserve. The launder from the mill is split and provided with a switch so that the material may be diverted to either box at will.

The launder is 30 in. wide, but increases to 60 in. as it enters the separator. The first section of the box catches the coarse sand, there being an adjustable steel baffle plate about midway to assist in throwing down the sand. The second section of the box catches the fine sand and slime, the overflow water passing out through the launder which gradually narrows again to 30 inches.

The bottoms of the boxes are hoppered to a series of sand spouts, the openings of which are adjusted by means of sliding plates. These spouts discharge to inclined punched plate screens which remove the feeding spouts, should there be a change in the amount of sand from the mill. Any such change is quickly shown by the quantity of water in the sand, but when the amount of sand is constant, no adjustment is required.

The Belt Problem

In the design of the Wolverine conveyers, the main problem was to provide a waterproof belt, and this had been found since the Mohawk plant was designed. The only waterproof belt that I know of is the balata belt. Balata is a vegetable gum found in Venezuela, in nature between gutta percha and india rubber. Balata is applied to the duck in a liquid form so that the gum penetrates and saturates every fiber of the fabric, thoroughly waterproofing it.

The U. S. Government dredge on the Fox river in Wisconsin is equipped with three 6-ply balata belts, 32 in. wide. A granite boulder fell from the belt and

became lodged against one of the idler pulleys. The edge of the belt rubbed against the boulder and pulley with the result that both were worn flat, and although the belt was worn down from 6 to 3 ply and was continually soaked in water, the plies exhibited no tendency to separate. A similar treatment of a rubber belt, allowing the water to reach the duck, would have brought about the rapid destruction of the belt by the opening up of the plies.

The lack of waterproof qualities in the rubber belts caused the main difficulties on the Mohawk installation, and in view of the satisfactory record of the balata belts on the Fox river dredge, balata belts were decided upon for the Wolverine conveyers. A special troughing idler was also used, giving a much wider pulley surface and a troughing angle suited to this type of belt. The belts used were 16 in. wide and 4 ply.

Driving the Conveyers

As has been already explained, the conveyer was built in two sections, the first, 600 ft. long, being driven by a multiple-pulley drive from the discharge end; the second section, 400 ft. long, with provision for extension to 600 ft., was driven from the loading end with a similar type of drive. This construction brought the two drives together so they could be driven from a single motor, which was belted to a countershaft, the conveyers being driven from this shaft by a special sprocket-chain drive. The countershaft was driven by a 15-h.p., direct-current, 220-volt motor, provided with a variable-speed rheostat.

A power test of the first section, 600 ft. long, lifting the material about 17 ft. and handling 40 tons per hour of sand, carrying 15 per cent. water, at a belt speed of 224 ft. per min., gave the following results: Empty belt, 5.8 h.p.; loaded belt, 7.7 h.p. The no-load reading, therefore, was about 75 per cent. of the full-load reading.

The launder from the separating box has a drop of 1/16 in. per ft., so that there is a total drop in the 1200 ft. of 6 ft. 3 in. Add to this a loss of 6 in. in the separator and there is a total loss of head room of 6 ft. 9 in. To discharge sand and water at a similar point, 1200 ft. from the mill, with either pump or sand wheel feeding a launder having a drop of ⅜ in. per ft., would require the lifting of the material at the mill 37½ ft. Allowing 2½ ft. for sump and discharge to launder, gives a total hight of 40 ft. to which the material must be lifted.

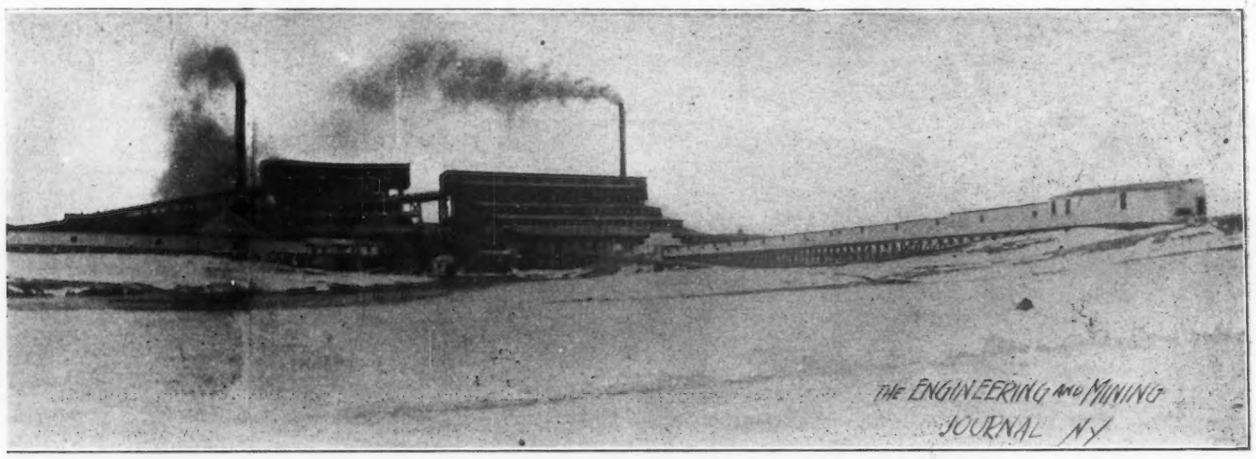
Power Required by Other Methods

The 8,500,000 gal. of water and 960 tons of sand have a total weight of about 36,400 tons, which, handled in 24 hours, gives a capacity of 1516 tons per hour. To dispose of this by the Wolverine method requires 15 h.p. Assuming a centrifugal pump with an efficiency of 60 per cent., lifting 1516 tons per hour to a hight of 40 ft., about 100 h.p. would be required.

There has been but little information published on the efficiency of the sand wheel, but 50 per cent. seems generous; assuming the same duty as for the pump 120 h.p. would be required. It is evident, therefore, that the Wolverine method effects a great saving of power and as the first cost is insignificant compared with either the pumps or sand wheels, the system should ultimately come into general use.

The perfection of this plant naturally required much experimenting and the design of the conveyers presented many difficult problems which were successfully solved by careful study. The long conveyers with light loads of water and sand require special designs throughout, and balata belts seemed to be necessary to a satisfactory plant, as rubber belts, "waterproof canvas belts" and imitation balata belts lacked the required waterproof qualities, when tried on the experimental work. The data used in this article were supplied by Willard J. Smith, assistant superintendent of the plant and the inventor of the separator and conveyer feed described.

In some metallurgical and chemical operations, steam is admitted to large vats or tanks for the purpose of agitating and, in some cases, heating their contents. In special cases, the consumption of steam for this purpose is enormous. It is often possible to obtain better results by mixing air with the steam. This may be accomplished by cutting in an ordinary Garfield injector. To insure the proper working of the device, the steam is first turned on, then the valve of the injector gradually opened until the desired amount of air is obtained. If it is desired to maintain the contents of the tank or vat at a certain temperature, the use of a thermometer will quickly indicate when too much air is being used. By the use of this device, better agitation is secured, the contents of the tank or vat suffer less dilution, and there is a large saving in the amount of steam used.



TAILINGS DISPOSAL PLANT OF WOLVERINE STAMP MILL, GAY, MICH.—MOHAWK MILL ON THE RIGHT

In mine reports, sketches, maps and photographs throw a great deal of light on the subject under discussion. In many cases such illustrations are absolutely essential. A sketch or a photograph will often tell more than a page or two of descriptive writing. With the aid of a tape, clinometer and hand level, or one of several instruments on the market that combines those mentioned (except the tape) in a compact form, it is possible to prepare fairly accurate maps of the surface and of underground workings. The data for such maps may be quickly collected, and the product will be sufficiently accurate for the purpose. Few engineers seem to be able to make an accurate and presentable sketch. The camera, however, is simple of operation and gives splendid results. Indeed, it may be said that a photograph is often more to be desired than even a well made sketch.

An Electrically Operated Hoisting Plant

A Novel Scheme Has Been Devised to Eliminate the Expensive Fly-Wheel Converter. Engine Is Stopped Automatically in Case of Mishap

BY A. GRADENWITZ*

The most serious drawback to the adoption of electrical operation in connection with main-pit hoisting engines, has so far been the expensive flywheel converter. This is eliminated by a novel scheme recently applied for the first time by Messrs. Brown, Boveri & Co., in connection with the Mauve pit winding plant of the Consolidated Heinitz mines at Beuthen, Upper Silesia.

This scheme utilizes the excellent maneuvering capacities of the Brown, Boveri, Parsons steam turbine, for transmitting any load fluctuations of the winding plant, without the intermediary of converters, directly to the boiler plant which constitutes an ideal accumulator. To a steam turbine of the above system, provided with a self-acting over-load valve, are coupled a rotary-current generator (intended for the general operation of the mines) and a continuous-current generator which drives the winding motor arranged in Leonard connection. The rotary-current generator forms the fundamental load to the turbine, thus improving considerably its steam consumption while absorbing at the same time any breaking shocks of the winding plant which it reconverts into useful electrical energy.

The mechanical part of the winding engine constructed by the German-Luxemburgian Mining and Metallurgical Company, is designed on the following data:

Depth	700 m.
Useful load	7200 kg.
Rope speed	10 m. per sec.
Winding output	230 tons per hour.
Diameter of winding pulley	8 m.

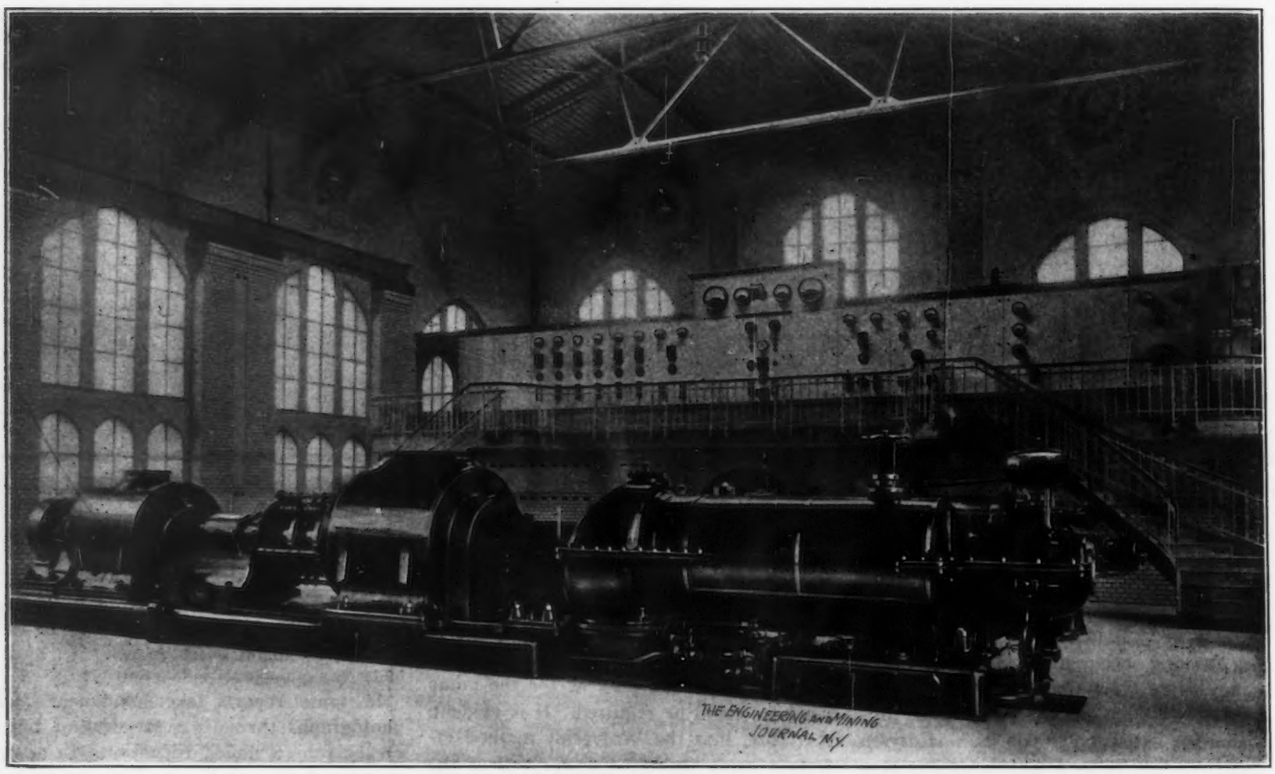


FIG. 1. GENERAL VIEW OF HOISTING TURBINE, CONNECTED TO A CENTRAL CONDENSER OF 90 PER CENT. VACUUM

The present electrical equipment designed for one-half of the useful load with the same rope speed, is to be doubled for the full useful load.

The winding turbine represented in Fig. 1 is a Brown, Boveri, Parsons turbine designed for steam at 9.5 atmospheres surplus pressure, and 275 deg. C. superheat at the admission valve, and connected to a central condenser of 90 per cent. vacuum. The automatical overload-valve of patented design is of special interest, being actuated, not by a centrifugal regulator—the operation of which would pre-suppose an alteration in the number of turns of the turbine—but by the steam pressure behind the ordinary regulating valve of the turbine. This steam pressure, producing a throttling action, is smaller in the case of normal loads than the pressure in front of the valve. As soon, however, as this valve, owing to a full load on the turbine, is opened entirely, any throttling action is bound to cease and the pressure behind the valve equals that in front of it. The automatical overload valve then leads some steam into an intermediary stage, thus increasing considerably the output of the turbine, which consequently can be designed in accordance with its average load. A further advantage of the overload-valve is its being worked earlier in the case of a lower pressure in the boiler plant, so as always to adjust for the proper output of the turbine, even in the case of fluctuating boiler pressures.

Regulation of the Turbine

The regulation of the turbine is so satisfactory, that a fluctuation of less than 2 per cent. in the number of turns, attends a sudden transition from the maximum positive load to the maximum nega-

*Berlin, W. 50, Regensburgerstrasse 3.

tive load of the winding dynamo. No alteration in the load of the winding engine has been able to disturb the working of the rotary-current dynamo connected in parallel.

quirements for excitation. The field regulator having to absorb quite an immaterial current, can accordingly be given very small dimensions.

The rotary-current generator is de-

SHOWING HOW THE ENGINE IS STOPPED AUTOMATICALLY

Fig. 2 is a general view of the winding engine. To the right of the steering jack is located a support with hand-wheel for

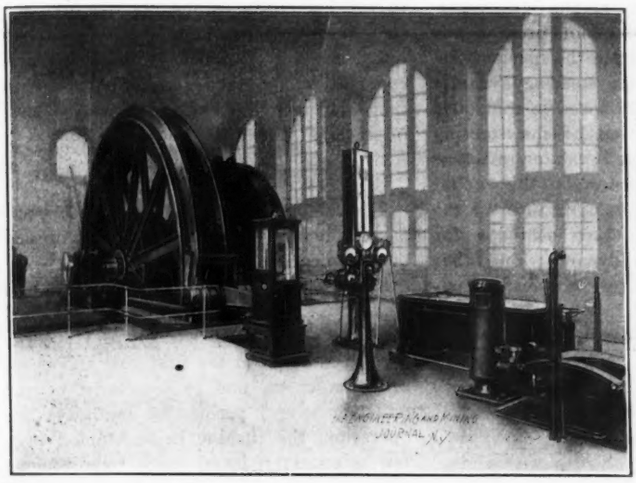


FIG. 2. GENERAL VIEW OF WINDING ENGINE AND STEERING JACK

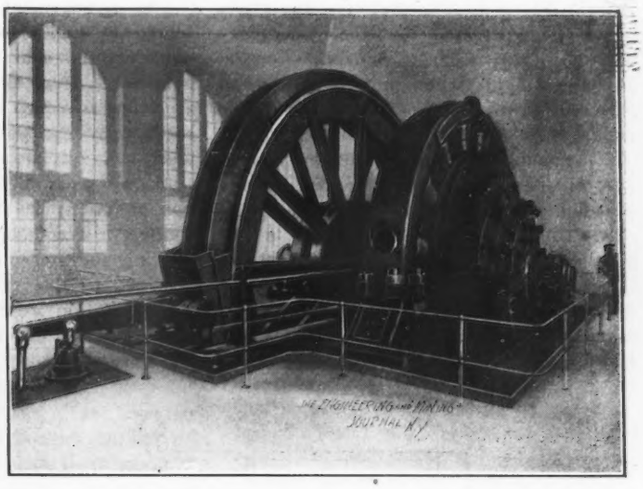


FIG. 3. SHOWING WINDING MOTOR, ONE OF THE LARGEST EVER CONSTRUCTED

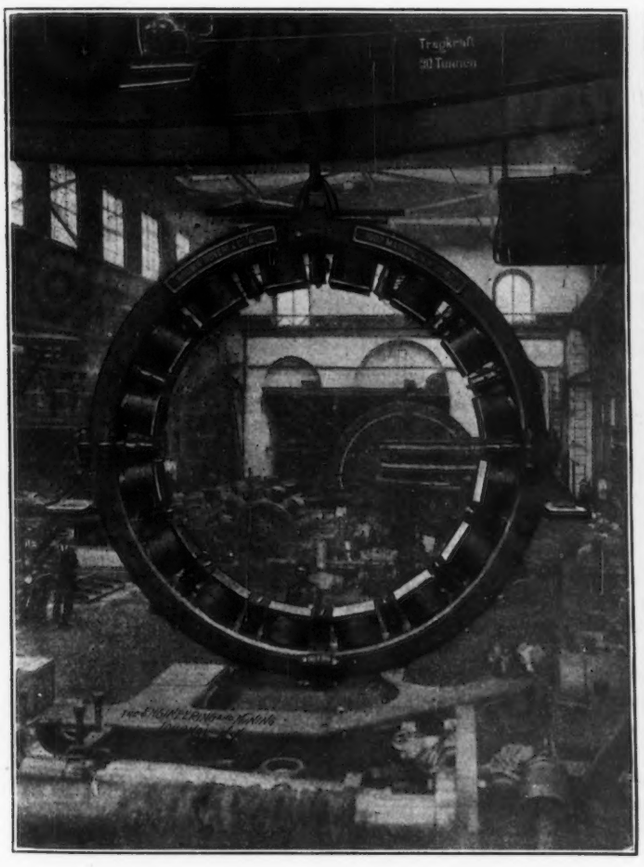


FIG. 4. SHOWING THE POLE-HOUSING

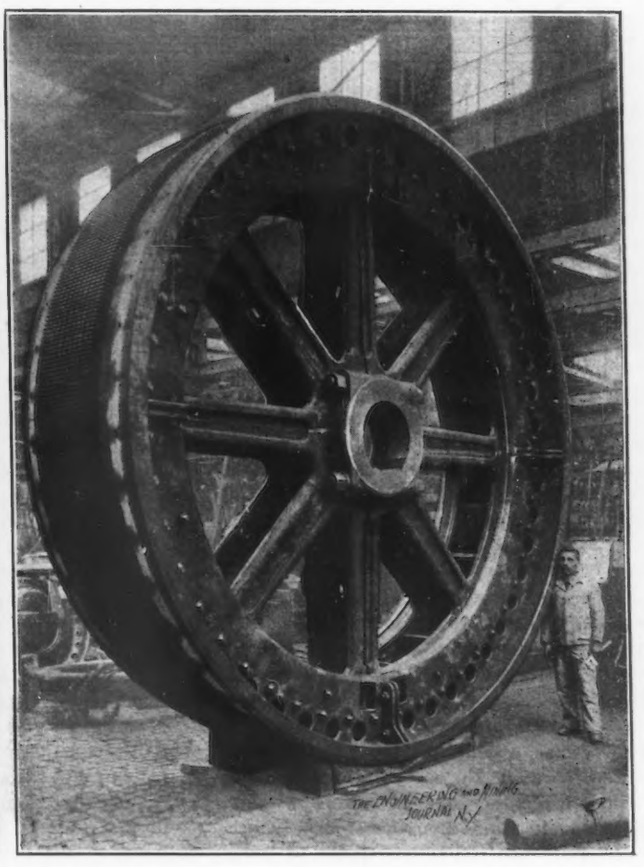


FIG. 5. VIEW OF ARMATURE

The continuous-current turbo-dynamo is provided with the well known Déri type of winding, which combines the advantage of a sparkless commutation at any load, with that of extremely low energy re-

signed for an effective permanent output of 1000 kw., corresponding to 1250 kilovolt-amperes with cos $\phi = 0.8$ and generates rotary current of 3150 volt with 50 periods per second.

actuating the emergency switch. In front of this is arranged the regulator, the contact slide of which is displaced by a chain-transmission. The depth-gage, provided with a slackening outfit, in the case of in-

advertency on the part of the machinist reduces the steering lever to zero, and whenever the cage gets beyond the pit-mouth, actuates the emergency switch and at the same time the safety brake, stopping in a minimum of time the previously slackened engine. Furthermore, the safety brake is actuated by the emergency switch; first, when the exciter tension fails; secondly, when the exciter tension exceeds by 15 per cent. its normal figure (that is, in the case of any undue increase in the number of turns of the turbo-generator), and thirdly, in the case of any inadmissible increase in the armature current of the winding motor, due to excessive loads or to the cage being jammed in the pit.

A switch column comprising all necessary electrical instruments and a compressed-air manometer as well as a Karlik speedmeter completes the equipment of the mechanic's stand.

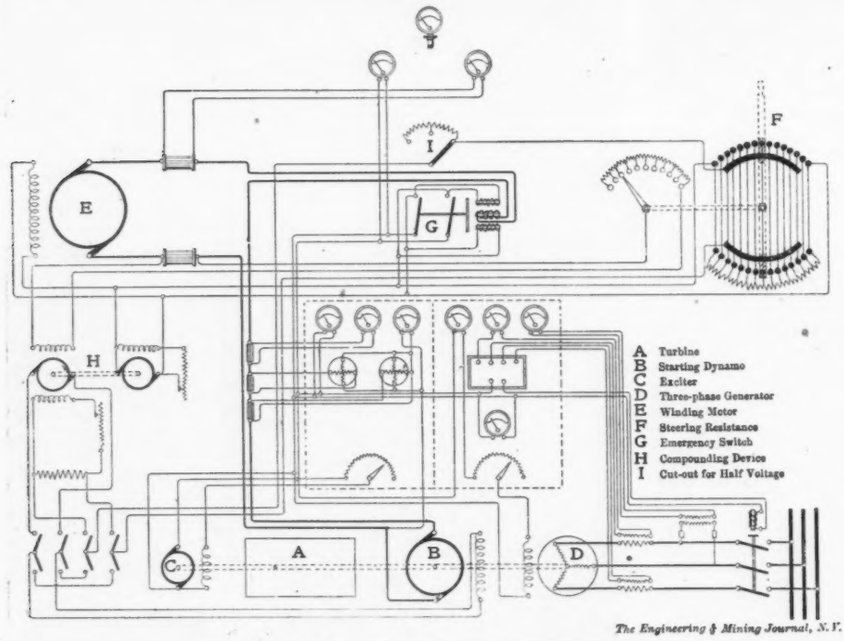


FIG. 6. GENERAL ARRANGEMENT OF CONNECTIONS

The Motor Armature

Fig. 3 represents the winding motor, which, on account of its low number of turns (24 r.p.m.), is one of the largest so far constructed. Its dimensions are illustrated by Figs. 4 and 5, representing the pole-housing and armature of the motor. A special winch has been provided in order to allow the motor armature to be rotated for the sake of repairs without getting hold of the rope. This winch comprises two rollers susceptible of being lifted independently by a lever system, on which rollers the coupling flange of the motor is supported while the clutch is disengaged. This arrangement affords the additional advantage of allowing the winding plant when definitely extended, to be driven independently by one of the motors, the other being uncoupled. The winch also allows of reducing the dimensions of the traveling chain, which need not suffice for the weight of the motor armature.

Arrangement of Connections

This arrangement of connections, represented in Fig. 6, does not present any novel features apart from the special compounding system of the steering dynamos according to which the speed is controlled entirely by the position of the steering lever. A special small exciter machine with two separate field coils—the excitation of one of which is controlled by the winding current—has been provided for exciting the steering dynamo; the other field coil of this exciter receives a variable excitation from a rheostat. Leaving the first-named exciter coil out of account, it is seen that the exciter dynamo would absorb a tension depending on the resistance of its second field coil. The excitation of the starting dynamo and accordingly its tension are thus controlled, not by a resistance in its exciter field, but by altering the excitation of its own exciter dynamo; this exciter tension is acted upon by the first main exciter coil in accordance with the main current of the winding motor in such a manner that a surplus or minus tension—according to the direction of this current—is generated.

The number of turns of the winding motor can thus be made to depend exclusively on the position of the steering lever, independently of whether the motor is absorbing or yielding current for the propulsion of loads, and independently of the magnitude of the latter. An additional advantage of this arrangement is that the controller has to deal, not with the exciter energy of the starting dynamo, but with the very small exciter energy of its exciter, so that its dimensions could even be reduced considerably below the dimensions so far in use.

As it is, the existing controller was retained in the present case, after having been provided with a switch, responding to the excitation of the starting dynamo so that the compounding can be switched out whenever required. This is found especially advantageous in connection with the adjustment of the machines, without interfering with the winding operation.

Advantages of Scheme

The advantages of this scheme as compared with the familiar Ilgner system can be summed up as follows:

Reduction in the number of engines and apparatus; absence of expensive flywheel converters, using up energy, and accordingly, reduction in the first cost and operating expenses, and improvement of the total efficiency; permanent readiness for operation, the turbine being started in a few minutes; reduced space requirements and possibility of using cheaper foundations.

New South Wales Coal Trade

F. Danvers Power, in an address before the Engineering Society of Sydney University says: "Since coal mining commenced in New South Wales, the price has fluctuated between 16s. 1.51d. per ton in 1853 and 5s. 4.86d. in 1898. The output of coal has more than doubled during the past 10 years. The following table shows the output and value during this period:

	Tonnage.	Value
1899	4,597,028	£1,325,799
1900	5,507,497	1,668,911
1901	5,968,426	2,178,929
1902	5,942,011	2,206,598
1903	6,354,846	2,319,660
1904	6,019,809	1,994,952
1905	6,632,138	2,003,461
1906	7,626,362	2,337,227
1907	8,657,924	2,922,419
1908	9,147,025	3,353,093

"It will be seen that the output and value do not vary in the same ratio, for the value per ton was not constant. In 1908, the total number of persons employed above and below ground in connection with the various collieries was 17,734. The value of coal raised for each person employed in and about the mines was £147 11s. 7d., or for each person employed underground £173 13s. 9d.; but from this sum not only wages but depreciation of plant, management, amortization and other expenses have to be deducted before the net profit is found."

According to statistics of the U. S. Geological Survey, the 1908 production of bauxite in the United States amounted to only 52,167 long tons valued at $263,968, while the 1907 production was 97,776 long tons valued at $480,330. Arkansas and Georgia were large contributors to the total output.

The Coal Mining Industry in Illinois During 1908

The report of David Ross, Secretary of the Commissioners of Labor of the State of Illinois, has been submitted to Governor Deneen. Considerable space in the report is given to a consideration of the prices charged for coal, the waste of powder, accidents, their causes in certain cases and suggestions touching the conservation of life and property in the coal mines of the State. Among other things, Mr. Ross says, "With a mining equipment easily equal to twice the demands of the market, the natural ambition to get business has resulted in the almost complete demoralization of prices on contract coal. Never before has coal sold to the big consumers at a price so near, if not in some instances, below the cost of production. In addition to general wasteful methods, we are robbing a valuable future inheritance and yielding up without adequate return, an essential element of present and future power.

"What a ridiculous commentary it is upon modern business sense when we are compelled to admit that the larger the concern, the less it has to pay for what it needs—that values are not based on worth or the labor required in their production, but on the side of the concerns with which we do business and the extent of the orders they may grant. A great railroad or other corporation lets a contract for 100,000 tons of coal and it is filled at $1 per ton or less; the private household consumer requiring 20, 30 or 50 tons per annum is charged $2.50 or $3 per ton delivered. The local trade is taxed for the benefit of the big consumers. If the larger buyers continue to dodge their share of the costs, the little ones must make good the difference.

"A business that taxes most those who can least afford it, is not conducted on the principle of the Golden Rule and its failure is but a question of time. If the transportation interests have not secured too strong a grip on the coal-mining industry of the country, it is possible to reorganize the business on a basis that will insure justice to all; a reasonable and uniform charge for an indispensible commodity; a fair return on the capital invested, and liberal wages for all classes of men engaged in the occupation. Instead of wasting brain tissue in the foolish attempt to get business at no-profit prices, better devise a plan that would distribute charges by withdrawing favors to great consumers, put all in respect to prices, on an equality, and the cost to the average consumer would be less, profit and wages could be increased while the necessities created by the present unbusinesslike system, which puts everybody at the mercy of someone else, would immediately cease to exist. It is a consideration devoutly to be wished, and its promise will not be realized until some of the power now wasted in mere quibbling over details is applied in a practical manner that will put the industry on a safe paying basis without oppressing or treating unfairly, any legitimate interest.

"It is impossible to make the small class of consumers believe, many of whom live in the coal regions, that the average reported value of coal at the mines is but a fraction in excess of $1 per ton, neither can they understand why they should be selected for discrimination in the matter of prices compared with favored rates granted the great consumers.

There is Ground for Complaint

"Under the prevailing system, if it is permissible to speak of it as such, there is valid ground for the double complaint, first, on the part of the smaller consumers that they are compelled to pay excessive prices for fuel, and second, on the part of the mine owners that, figuring on the prices at which the entire output is sold, there is but little, if anything, in the business for them. So dangerously close has the margin become, that any change in the way of legislation or otherwise designed to further protect employees, if it adds to the cost of production in a degree, however insignificant, is followed by a threat to close the mines. When an industry reaches a point where the men who have their money invested feel more secure with their property idle than in operation, the time has certainly arrived to test the sanity of present business methods.

"The total product for the year was 49,272,452 tons, of which amount the 407 commercial mines furnished 47,809,730 tons, and the 515 local mines, 1,462,722 tons, representing about the usual ratio between the shipping and local mines. There was employed in every capacity in and about the mines 70,841 men, of which number 46,194 were miners employed in the shipping mines, an average of 191 days during the year and producing 1033 tons per miner.

"More than one-third of the entire tonnage was cut by machines. Notwithstanding an unfavorable machine mining rate, the quantity of coal secured through the use of machines continues to steadily increase. Naturally with an increased machine tonnage the quantity of powder used in blasting would decrease proportionately. The figures show the reverse to be true and that while the machine tonnage for this year compared with last, increased 719,969 tons, there was an increase of 66,544 kegs in the quantity of powder consumed of an average of 34 tons of coal to each keg of powder.

An Increase in the Amount of Powder used Per Ton of Coal Produced

"The coal miners attribute the increase to the fact that powder is cheaper than formerly and therefore inferior in strength. The powder companies insist that there has been no change either in the composition of the product or in the process of its manufacture. It would seem unnecessary to seriously consider either of these claims, but where the facts show that it requires the consumption in solid-shooting mines of nearly one pound of powder for every ton of coal produced, the results cannot be considered in any other way than as a condemnation of existing methods.

"In the thick coal seams of the State, furnishing 73.3 per cent. of the total product used, powder or some other explosive equally powerful, will be necessary in the process of extracting coal, whether it is undercut before shooting or not. The question therefore resolves itself to the simple proposition, whether having in view the conservation of life and property, we shall continue to commit to incompetent and careless hands, the use of dangerous explosives, or provide, either by statute or mutual agreement, that only men specially educated and trained for such work shall be employed, whose exclusive duty it shall be to drill holes, charge and fire same. In commenting on this question in the 1906 coal report, in which such a plan was recommended, reference was made to the great and unnecessary expense entailed in the present promiscuous use of powder. On the assumption that fully one-half of the powder consumed was practically wasted, a loss that could be avoided under the proposed plan, in addition to the saving of lives and the production of a better quality of coal, it was estimated that nearly one million dollars could be saved annually to the miners.

"So terrific have been some of the explosions in our coal mines, that, had they occurred while the usual complement of men were at work, not a single life would have been spared. It was the consideration of such a possibility that induced the legislature to enact the shot-firers law, effective July 1, 1905. The law was, and is, subject to the fair criticism that it transferred the responsibility from the man who prepared the improper shot to the man whose duty it now is to fire the shot. The friends of that law could not do otherwise than admit the truth and force of such an objection; but in answer thereto, they set up the justifiable plea that if the lives of men had to be sacrificed in such work, it was the part of wisdom to expose the least number possible to the deadly fury of the blast.

"Taking the years from 1903 to 1908 inclusive, three years preceding and three years succeeding the enactment of the shot-firers law, it is found that the loss of life directly due to the use of powder is nearly 40 per cent. less during the three-year period that the law has been in operation, during which time there has been a material increase both in the tonnage and in the number of men employed. It was

the intention of the law to protect the shot-firer in his refusal to fire shots which in his judgment, were dangerous.

"The causes from which many shot-firers have lost their lives, indicate either that many of them were selected without considering their qualifications for such employment, or that their judgment was defective. No matter what the cause, whether bad judgment on the part of the shot-firers or undue haste in the discharge of their duties; or a desire not to offend miners whose shots were not properly located or prepared, the law has not been given a fair trial. The deaths in most instances resulted from the firing of dead holes, which is strictly forbidden by the law.

"If the enforcement of the law had been intrusted only to men particularly equipped for that kind of work, the percentage of loss would have been considerably less.

"Of the 29 fatalities reported this year as a result of using powder, 14 were shot-firers, and 15 miners; seven of the miners lost their lives in an ignorant and unlawful effort to prepare shots, which is an additional reason why some plan should be adopted that would entirely divorce the present class of miners from all connection with deadly explosives.

"In the general classification of fatal accidents, it is noted that of the 183 fatal accidents this year, one-half, or 49.7 per cent. resulted from falling roof and coal at the working faces of rooms and entries. Mine cars account for 35, or 6 more than are due to the use of powder. No amount of legislation can make absolutely safe the business of coal mining. The occupation, by its very nature, is hazardous, and accidents from one cause or another will continue to occur. In respect to the accidents resulting from falling slate and coal, many of them are due to carelessness and therefore, are preventable.

"The statement that 'familiarity breeds contempt' is as true of danger as of other things. Men whose occupations expose them to a certain class of known risks, become indifferent and are willing at all times to take chances. It is this association with dangers and the natural disposition of men that swell the totals of our casualty lists. As a means of protecting our miners from themselves, it has become the custom recently in certain coal-mining districts for companies to employ what is known as face bosses, whose duty it is to visit men while at work, and when they note any dangerous places, to insist upon the miners propping them without delay. A very material reduction in the customary number of accidents from such causes in those districts has resulted, and the general adoption of such a practice in the State, would doubtless have a most salutary effect. Men who have followed the business of coal mining, know how natural it is for those, who while fully advised of a bad roof, in their eagerness to complete some other work, will defer propping it only to be caught in its fall later on. If it only cripples him, he becomes a charge upon his family and friends during recovery; if it proves fatal, a widow and perhaps a number of orphan children suffer and pay the penalty of parental carelessness.

Summer Meeting of the Coal Mining Institute of America

EDITORIAL CORRESPONDENCE

The Coal Mining Institute of America, held its regular midsummer session at Punxsutawney, Penn., June 29-30, July 1. More than 100 members were present from Pennsylvania and adjacent States. The afternoon and evening of the first day of the session were devoted to the reading and discussion of the various papers.

The most animated discussion followed the reading of Mr. Campbell's paper on "The Pyrometry of the Beehive Coke Oven." There was also considerable comment following Mr. King's paper entitled, "The Sociological Side of Coal Mining." This latter discussion centered principally on the question as to the best plan of regulating the liquor problem in coal mining camps. Mr. King presented figures to support his argument that by placing a limitation on the amount of liquor supplied to each family, and by offering inducements in the way of better houses to those miners whose alcohol record is cleanest, the consumption of alcohol in a mining town can be materially reduced. Some of the members present contended that there could be no such thing as a well regulated saloon, and that the manager of such an establishment is sure eventually to consider only the money that can be made, and neglect to act in a restraining manner when such a course would be advisable. It was further argued that when miners meet in a saloon, the intermingling of so many nationalities is not beneficial, and often leads to greater disorderliness than is the case when liquor is furnished separately to each family.

It seldom occurs that those who arrange for the entertainment of a convention such as this, succeed in preparing such an enjoyable program. The second day of the meeting was devoted to a visit by special train on the Buffalo, Rochester & Pittsburg Railroad and the Buffalo & Susquehanna Railroad to mining plants in Indiana and Armstrong counties. The train on which the trip was made, had a café car attached, and from the moment the whistle blew at the beginning of the journey, there was no occasion for any member of the party to go hungry. Stops were made at the Iselin, Ernest, Juneau, Sagamore and other important mines, so that the institute members could carefully inspect the elaborate installations that are now located in this field.

On the third day of the session the party made visits by automobiles to mining plants in the vicinity of Punxsutawney and Du Bois, Penn. These mines are older and less modern operations than the plants visited the day before. The number of applications for membership was unusually large, and the meeting as a whole was one of the most instructive and pleasant yet held.

To fill the vacancy created by the death of President B. F. Jones, the Institute elected H. H. Stoek of Scranton, Penn., as president; Mr. A. W. Calloway of Punxsutawney, was elected first vice-president to succeed Mr. Stoek.

This brief summary of the meeting would be incomplete if we failed to recognize the excellent work of the reception committee of which Mr. Calloway was chairman. The arrangements for the entertainment of the guests could hardly have been improved upon, and it is certain that the program was so varied that none of the members present can complain of a dull three days.

The Efficiency of Sprinkling

On Nov. 15 of last year, a disastrous mine explosion occurred at the Radbod mine in Germany. At the time of the explosion many authorities claimed that dust was the destructive factor, and that since this mine was watered at regular intervals, the accident went to prove the inefficiency of such a system of sprinkling. It now appears from a more careful examination, that the explosion was due to gas rather than to coal dust. One engineer, who is an advocate of the sprinkling system in mines, defends the watering system used at the Radbod property by stating a number of facts that seem to prove the gas theory. This authority says that fires occurred in different parts of the mine, indicating that the heat developed by the explosion was greater than is usually the case with coal-dust explosions. Also that during the flooding of the mine 10 days later, there occurred a second powerful explosion which could only have been a firedamp explosion. He says that these circumstances force the conclusion that the initial explosion was caused by a sudden great outbreak of gas. In contradicting the argument that such sudden appearances of great quantities of gas have never taken place in Prussia, the same authority mentions that since the accident in Radbod, a sudden outburst of gas has occurred in another mine in the same district. An explosion in this latter case was only prevented because the sudden pressure of air extinguished all the lamps which were in the district affected.

THE ENGINEERING AND MINING JOURNAL

Issued Weekly by the

Hill Publishing Company

JOHN A. HILL, Pres. and Treas. ROBERT MCKEAN, Sec'y.
505 Pearl St., New York.

London Office: 6 Bouverie Street, London, E. C., Eng.
CABLE ADDRESS "ENGMINJOUR, N. Y."

Subscription, payable in advance, $5.00 a year of 52 numbers, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii or the Philippines. $6.50 in Canada.

To foreign Countries, including postage, $8.00 or its equivalent, 33 shillings; 33 marks; or 40 francs.

Notice to discontinue should be written to the New York office in every instance.

Advertising copy should reach New York office by Thursday, a week before date of issue.

For sale by all newsdealers generally.

Entered at New York Post Office as mail matter of the second class.

CIRCULATION STATEMENT

During 1908 *we printed and circulated* 507,500 *copies of* THE ENGINEERING AND MINING JOURNAL.

Our circulation for June, 1909, *was* 49,500 *copies.*

July 3..... 15,000
July 10..... 9,500

None sent free regularly, no back numbers. Figures are live, net circulation.

Contents

PAGE

Editorials:
Selling a Mine..... 79
The Lackawanna Plan..... 80
The Steel Corporation and the Amalgamated Association..... 80
*Wallaroo and Moonta Copper Mines and Smeltery...*Gerard W. Williams* 55
Asbestos in Japan. *Special Correspondence* 59
The Gowganda Region in Ontario. *Special Correspondence* 60
A New Pyrometer..... 61
The Exploration Company..... 61
*Revival of Mining in the Mogollons, New Mexico....*E. Gybbon Spilsbury* 62
Sulphate of Ammonia in Great Britain 65
The Manufacture of Nitric Acid from Air 65
*The Proper Design of Cams..... 66
St. John del Rey, Ltd..... 67
An All Slime Cyanide Plant at Guanajuato, Mexico.....*Edwin Shapley* 68
Problems of the Russian Oil Industry. *Frank Richards* 69
*Unusual Centrifugal Pump..... 70
Dominion Iron and Steel Company..... 70
*Tailings Disposal Plant at the Wolverine Mill.....*C. Kemble Baldwin* 71
*An Electrically Operated Hoisting Plant.....*A. Gradenwitz* 74
New South Wales Coal Trade..... 76
The Coal Mining Industry in Illinois During 1908..... 77
Summer Meeting of the Coal Mining Institute of America. *Editorial Correspondence* 78
The Efficiency of Sprinkling..... 78
German Potash Syndicate..... 81
Iron and Manganese Ore in Brazil..... 81
Waihi Gold Mine. *Special Correspondence* 81
Geology of the Manhattan District, Nevada.....*Walter P. Jenney* 82
The Position of the Electric Furnace. *P. McN. Bennie* 84
Rhodesia and the Chartered Company. *Special Correspondence* 84
Protective Screen for Zinc Furnaces.... 84
New Publications..... 85
Personals, Obituaries, Societies and Technical Schools..... 86
Special Correspondence..... 87
Mining News..... 90
Markets..... 95

Illustrated.

Selling a Mine

At the recent meeting in London of the Oroya Brownhill Company, Ltd., to which we referred recently, Herbert C. Hoover, the managing director and well known engineer, made some illuminating remarks respecting the purchase and sale of mines. His company for a long time has been searching for a new mining property. It was early decided not to undertake ventures of a highly speculative order, but rather to secure a property possessing some commensurate value in actually exposed profits. "There is no scarcity of mines in London for sale," said Mr. Hoover. "There are always two difficulties that confront one in dealing with these; the first difficulty is the price, and the second difficulty is to find out the truth about the property." Mr. Hoover then gave some figures from his recent experience which we reported fully a fortnight ago. In brief, out of 680 properties looked over, 550 were quickly rejected, 20 were exhaustively examined, three were taken under working options and one was purchased. These figures are admirably illustrative of the half-baked condition in which the majority of mining projects are presented, and of the exaggerated terms that are generally asked.

The ordinary vendor fixes his price upon his idea, generally fanciful, of what he would like to get; not upon any well defined idea of what his property is actually worth. In one way and another this results in a frightful waste of money. The misguided vendor fritters away time and traveling expenses; the mining houses are put at great expense in winnowing out the chaff from the wheat; worst of all, some of the projects rejected by qualified promoters fall into the hands of the ignorant and unscrupulous who take them up as means for parting the unwary part of the public from its money.

Fortunately conditions in this respect are not now so bad as they used to be. The spectacular misadventures and swindles, like the sale of the Emma mine back in the '70s, have steadily been becoming fewer. This is, of course, as it should be, marking a progress in knowledge and experience. Nevertheless, we are still very far from reducing mining to a strictly business basis. Ninety per cent. of the consulting mining engineers still deplore that the chief demand for their services is from clients who need them to act as a doctor for a moribund mining venture.

The direction for improvement in this phase of the industry lies in closer coöperation between the owners of mining property and the mining engineers. Under present conditions, it is seldom satisfactory for an engineer to undertake an examination and report in behalf of a vendor. Some engineers announce that they decline that kind of work. This is often taken to imply that they consider the undertaking of such work to be discreditable. As a matter of fact, there is nothing discreditable about it; and an honest engineer may make a report for an honest vendor without any loss of prestige, and generally to the advantage of both concerned; the declination of some engineers to enter upon such commissions is based, we believe, rather upon the desire to avoid unpleasant features that too often arise.

John Hays Hammond has been criticized for some of the advice that he has lately been giving to mining students in commencement addresses. He may have unduly emphasized some of the commercial features of the mining industry, but nevertheless we are disposed to think that on the whole he has been giving good advice. In a recent address at the Colorado School of Mines, he made the following remarks "For many years I have strongly advocated the evolution of the engineer and expert into that of the 'mining man.' There is now interposed between the mining engineer and the investors a class of men known as promoters. To what I regard as the butting in of these mine promoters I ascribe the failure of many mining enterprises. These promoters are, as a rule, men who have but a superficial knowledge of mining. Indeed, many of them have been failures in other walks of life, and have gone into this vocation because of the fact that it presents unusual opportunities of getting rich quickly. Not only are the majority of men in this class incompetent and ignorant about mining matters, but they are very often unscrupulous as well. But here let me say that I recognize the fact that there are among these mine promoters many men who have a fairly good knowledge of practical mining, and who possess undoubted integrity. I should like to see the mining engineer acquire such a knowledge of business methods as to enable him to take the place of the mine promoter. This would prevent overproduction, so to speak, on the

part of the mining schools of the country, which are annually turning out hundreds of mining engineers. It would also insure that mining investments would be placed upon a more conservative basis, thereby greatly minimizing the risks of such investments. To the engineer who in that way becomes the mining man to whom I have referred, an interesting and remunerative field for his professional activities would be opened." We may add that there would be also a better protection of the investor and an increase in the prestige of the mining industry.

The Lackawanna Plan

The Delaware, Lackawanna & Western, one of the larger anthracite-carrying companies, meets the Supreme Court establishment—and limitation—of the commodities clause of the Interstate commerce law by a device which has some elements of novelty. The law, as interpreted by the court, prohibits railroads from carrying coal which they own; but it cannot prevent them from mining coal or selling it, as long as they do not own it at the time it is carried over their lines. Most of the anthracite railroad companies mine their coal through the medium of a subsidiary company and do not, therefore, come under the law. The Lackawanna has always owned and mined its coal without the intervention of another organization. It was, in fact, a coal company in the first place, its original railroad having been built solely for the purpose of carrying its coal to a market.

The company does not transfer its mines, doubtless seeing some advantage in continuing to work them and to hold its original Pennsylvania charter. It has organized a coal-selling company, which will buy all the coal as mined, and will have charge of its sale. It will pay transportation charges to the railroad, and will, therefore, be the owner of the coal while in transit, thus complying with the strictly legal requirements. It is worth noting that the contract provides that the purchasing price shall be 65 per cent. of the tidewater selling price of coal, which is the rate at which the anthracite companies have been buying the coal mined by the individual operators. The selling company will start with a large working capital, having $6,800,000 stock, paid for in cash. This stock will not be held by the railroad company, but will be sold to the stockholders; provision against a possible —but quite improbable—future change of ownership being made by a clause in the contract which allows the railroad company to terminate it on brief notice.

It may be added that the Lackawanna company thoughtfully provided its stockholders with means to buy the coal stock by declaring a cash dividend of 50 per cent. The announcement sent its stock on the Exchange to the record price of $680 per share, though very little of it is for sale. Few companies have the ability or the disposition to treat their shareholders so liberally.

The Steel Corporation and the Amalgamated Association

The strike which began on July 1 in the union plants of the American Sheet and Tin Plate Company—a subsidiary of the United States Steel Corporation—is notable as being the first serious difference between the Corporation and organized labor. The strike on the Mesabi iron range two years ago may perhaps be considered an exception; but that was on a wholly different basis and was not directed especially against the Steel Corporation mines, nor was it really a rational, well organized movement.

The Amalgamated Association of Iron, Steel and Tin Workers, which is concerned in the present strike, is one of the oldest labor organizations in the trade, and has generally been managed on rather conservative lines. It has lost something of its importance through the substitution of steel for wrought iron, as it was originally an organization of puddlers; but it still controls a great majority of the skilled workmen in a large and important branch of trade. The American Sheet and Tin Plate Company makes between 60 and 70 per cent. of the products which its name implies in the United States. The greater part of its works were union plants, in which wages were controlled by the yearly agreements made with the Amalgamated Association, but it has had also non-union plants in which the men were not members of the association, though they usually worked under the same wage scale. The union scales have run for the year ending June 30, and were settled each year in conferences between the employing companies and representatives of the union.

This year the American Sheet and Tin Plate Company announced in advance that it would hold no conference, but that after July 1 all of its plants would be run on the nonunion or open-shop plan. No reduction in wages was announced, so that the question presented turned entirely on the recognition of the union. The other parties dealing with the union are the Western Bar Iron Association, an organization of a number of independent bar-iron makers, the Republic Iron and Steel Company, which has extensive plants in the East and South, and some independent tinplate plants in Pennsylvania and Indiana. With the Western Bar Iron Association and the independent tinplate makers the Amalgamated Association has already made a settlement for the coming year; while its officers are in conference with the Republic company, the prospect being that an agreement will be concluded without any serious difficulty. The strike now begun is, therefore, only against the American company—that is, the Steel Corporation. As previously said, it does not turn on the question of wages, but entirely on the recognition of the union.

The important point is whether this presages—as many observers think it does—an intention on the part of the Steel Corporation to bar all organized labor. The management of the Amalgamated Association has been for the most part conservative and reasonable and it has not made for exorbitant wages and for constant trouble, like some of the miners' unions. A fight between the Steel Corporation and organized labor would be of national importance.

THE NOTES ON the German Potash Syndicate given on another page are to be taken with a certain amount of caution as they are possibly rather more sensational than the situation warrants. Nevertheless they are believed to be substantially correct in outlining the conditions. It is not quite clear what American interest is at present concerned in the proposed purchase of one of the large potash-salt mines. It is known, however, that one fertilizer interest in this country holds an advantage of value under its existing contracts, and it is not at all extraordinary that others should try to secure a similar one. The potash industry, with its practical monopoly of production, is a very valuable one to Germany, and it is readily understood that the Germans will try to hold it; but the suggestion of a high export duty is hardly credible.

German Potash Syndicate

According to recent press despatches Germany's most powerful industrial combination, the potash syndicate, which controls the world's supply, is on the brink of disintegration as the result of American enterprise. The members of the syndicate were in conference in Berlin for the last two weeks in June, debating terms for a renewal of their pooling arrangement, which expired June 30. The syndicate's rules provided that if a renewal had not taken place by July 1 the individual members should have the right to make sales regardless of the combination's schedule.

At 2 o'clock the morning of July 1 a bombshell was dropped into the meeting, which was still in session at the Hotel Adlon, by the owner of the Sollstedt mine, one of the largest in the combination, who announced that since midnight his property had passed into the possession of the American Agricultural Chemical Company. This transfer meant that Americans, who are by far the largest foreign consumers of German potash, would no longer submit to the extortion the syndicate had hitherto been able to practice by reason of its absolute monopoly.

This announcement spread the utmost consternation. The Prussian government, which was a leading member of the combination, led a movement to resort to prompt and radical extremes to block the Americans' game. Its first proposal is to nullify the American coup by inducing the Imperial government to impose an export tax of 100 per cent. on potash. This obviously is more or less of a bluff, as such a tax would automatically deal a heavy blow to the Germans themselves.

Efforts are now afoot to renew the combination for another term of years, but the change in the ownership of the Sollstedt mine has thrown all negotiations into chaos. The syndicate adjourned its meeting for a week in the hope of inventing ways and means for circumventing the "American peril."

Later despatches state that the German potash syndicate has agreed to continue the existing mutual protective arrangement provisionally for one week in order to permit of further discussion with American interests. Beyond this nothing definite in the matter of selling potash property to Americans has been decided.

The latest despatch, bringing the news up to July 7, says: With the exception of one man all the members of the former potash syndicate and some new ones have signed a new mutually protective agreement. The exception is Waldemar Schmidtmann, proprietor of the Sollstedt and Ascherleben mines, who in 1907 made contracts to supply various American fertilizer concerns with potash for a term of 10 years. Herr Schmidtmann is considering whether he will derive greater advantage from joining the syndicate or remaining independent. The American agents here have been offered various potash mines, but as the prices are unsatisfactory, none of the negotiations has been brought to a conclusion.

Iron and Manganese Ore in Brazil

United States Consul-General George E. Anderson, of Rio de Janeiro, reports as follows concerning the iron- and manganese-ore deposits of Brazil:

Iron-ore Deposits

The Brazilian government has just transmitted a report, for the use of the authorities having in charge the preliminary preparations for the International Geological Congress, which meets next year in Stockholm, covering certain iron-ore deposits in the Republic, the result of a survey sent out for the purpose, with a special expert at its head; and although the text of this report is withheld, pending the use to be made thereof by the authorities for whom it was prepared, an outline of it has been secured by this office.

The examination of the deposits in Minas Geraes located 52 outcroppings of ore which was from 60 to 75 per cent. pure iron, free from all impurities which might interfere with its proper smelting. Of these outcroppings the expert selected nine of average size and quality, which he carefully surveyed and measured, calculating their contents at a little less than 1,000,000,000 tons of high-grade ore, on or near the surface and in situations permitting easy working and economical handling. On the basis of the surveys made the 52 deposits contain a little less than 6,000,000,000 tons of the highest-grade ore. In addition, loose high-grade ore was located to an amount as large as that found in the outcrops, the total high-grade ore located thus amounting to 12,000,000,000 tons.

As Brazil, for various reasons, will be unable to work these vast deposits, they have recently been visited by representatives of American and British syndicates with a view to making contracts for ore shipments, in the immediate future, from Rio de Janeiro or from Victoria, about 300 miles north of Rio de Janeiro. The only result of these visits, as far as known, is the completion of a contract between a part of one of the British syndicates and the Victoria & Diamantina Railway Company for ore shipments via Victoria.

Manganese Mining Industry Depressed

The exports of manganese ore from Brazil in 1908 were valued at $1,200,868 against $2,442,984 in 1907. The exports of the ore to the United States in 1908 amounted to only $140,648, as compared with $521,581 in 1907.

According to Brazilian newspaper reports, the high freight rates on ore shipped by rail to the seaboard are the cause of the depression, but as a matter of fact the high cost of production shares equally with the freight in causing it. When the exchange value of the milreis is low, manganese ore can be profitably mined, but when the exchange value rises to 30c., as at present, mining becomes unprofitable. Manganese ore is sold abroad at gold prices, while it is produced on a paper-currency basis. When an American dollar received for the ore was worth 4 milreis the gold cost of the ore was about 25 per cent. less than when the dollar was worth only 3 milreis, the paper cost remaining the same.

Waihi Gold Mine

Special Correspondence

During the year 1908, this New Zealand mine produced bullion to the value of £930,511 from 393,214 tons, or an average return of 47.3s. per ton. The expenditure in New Zealand and London, including development work at the mine amounted to £381,392. Including the sum of £9023 for interest, there was a gross profit for the year of £558,141, being an increase of £27,230 over the profit made in 1907. The dividends paid during the year 1908 amounted to £371,930, or 15s. per share, besides which there was a bonus of 2s. per share recommended for payment at the close of the year, making a total distribution of 17s. per share. The present price of the shares is about £9 2s. 6d., at which price the return equals 9.3 per cent. The ore reserves on Dec. 31, 1908, were estimated at 1,329,872 tons, being somewhat larger than at the corresponding date of the previous year. In order to have reserve pumping capacity a new installation is being made, consisting of two 750-h.p. Crossley gas producers, two 368-h.p. gas engines and two electrically driven three-throw plunger pumps with a capacity of 1500 gal. per min. The power plant will be erected at No. 5 shaft, and the power transmitted electrically to the pumps at No. 4 shaft when needed. When not required for pumping the power will be used for driving air compressors and other machinery at No. 5 shaft. The revenue account has been charged with the whole of the capital expenditure on new plant during the year, amounting to £41,511, as well as with the sum of £36,374 for depreciation of plant and machinery. No sinking has been done in any of the shafts during the year. The mine has six shafts, the deepest of which is No. 5, 1020 ft. The assay value of the ore treated averaged 54s. 10d. The average yield was 47s. 3d., making an average recovery of 86 per cent. The development of the mine continues to be of a satisfactory character.

Geology of the Manhattan District, Nevada

Prevailing Rocks are Metamorphic Shales, Quartzites and Limestone of Pre-Cambrian Age; Little Faulting after Deposition of Ore

BY WALTER P. JENNEY*

The geological structure of Manhattan district is comparatively simple; especially is this true when it is contrasted with the highly complex ore-bearing formation of other mining camps in Nevada. The prevailing rocks are metamorphic shales, quartzites and limestone of pre-Cambrian age. Along the northern side of the district there is a broad belt of volcanic rocks that were mainly erupted during the Tertiary. Notwithstanding that the Toquima range is largely made up of volcanic formations, it is seldom that igneous rocks are found within the sedimentary area described. It will be shown, however, that an intimate relation exists between these late Tertiary volcanic disturbances and the formation of the ore. The sedimentary strata are strongly folded and upturned, and in places are heavily faulted. Most of this faulting occurred prior to the formation of the deposits. It is rare in the mines of Manhattan that faults are encountered cutting off the ore, or disturbing the continuity of the veins.

The Toquima range has been repeatedly subjected in its past history to erosion, so that in places only a remnant of the sedimental strata remains. These successive erosions afford evidence that gold-bearing quartz veins have been formed at distinct and widely separated periods in the geologic history of the district. The coarse gold, in rounded grains or water worn nuggets in the deep placers of lower Manhattan gulch, is different in the appearance and character, in the relative proportion of gold to silver, and in the associated quartz, from the crystalline gold, derived from the wearing away of the later formed veins.

Examined more particularly, it is seen that metamorphic shales occur in great variety in the district; that the broad belts of silicious shales are commonly barren, or only carry small or low-grade deposits of ore; while the calcareous, or lime-shales, associated with belts of crystalline limestone, are more favorable to the occurrence of ore-bearing quartz veins. In a different way, the thick strata of quartzite which occur interbedded with the limestones and shales, are frequently altered to massive quartz; but from some cause do not carry gold in quantity sufficient to admit of economic extraction. In places, however, the quartzites carry workable ore at the contact with strata containing lime. The highly favorable nature of limestone, as a wall-rock of the veins, is strongly marked throughout the district, the deposits of ore being more regular and continuous, as well as more uniform in their content of gold, wherever the veins occur in limestone. Often a vein will be found to pay where it traverses rocks containing an excess of lime; but on entering silicious shales or quartzite, becomes barren, or only carries occasional small deposits of ore. It is this ore-bearing character of these lime-belts, which has caused them to be regarded as mineral zones or lodes, similar in their nature and structural features to the lead-silver lodes of limestone at Eureka, Nevada, and certain silver mining camps in Utah and Idaho. The most favorable limestones for ore are coarsely crystalline pure carbonates, which are readily soluble in surface waters and have, in the deposition of the ore, been readily replaced by silica and converted into quartz. Such a lode or belt of mineralized limestone and lime shales follows in its outcrop the crest of Litigation hill and extends through the Manhattan Consolidated property.

A small mud-dike, of volcanic origin, has been developed in the mine-workings on the Katie and Silver Pick locations; it courses northeast-southwest, dipping steeply to the southeast, and cuts at an acute angle through the Consolidated vein, near the main shaft. It is known as the "mud vein" and appears to be a local occurrence.

In the age of the ore-bearing formations, and in some of the peculiar features of the occurrence of ore, there is a resemblance of Manhattan to the mining district of Marysville, Montana, where are situated the Drum Lummon, Penobscot and other noted gold and silver mines.

The Lodes and Veins

The ore-bearing fissures are naturally separated into two systems; (1), the east and west fissures, which are the result of a strong fault-movement imparting to them certain of the characteristics of fissure veins; and (2), the north and south cross-fissures, or verticals, of more recent formation than the veins of the first system. Further, the cross-fissures are far more numerous than the veins, and are commonly of less breadth; they occur in belts, irregularly distributed over the district, are parallel in course, and nearly vertical in attitude. The intimate association of these fissure systems, crossing and intersecting one another, with the belt of limestone and calcareous shale described causes the ore formation, viewed as a whole, to resemble in some of its features, a mineral-zone or lode. The manner in which the deposits of ore have been confined in their formation to this zone of lime-bearing rocks, further supports this view, that from the standpoint of the miner, the limestone is the lode.

The ore formation is more readily understood if we consider the systems of fissures separately and then discuss their relation in connection with the lime-zone, and its influence upon the deposition of the ore. A prominent lode of this first system traverses the Manhattan Consolidated ground and extends westerly into the Earl and Dexter-Union properties, on Litigation hill. In places it cuts the sedimentary strata on both strike and dip, although the fissure more often displays a tendency to follow the bedding of the limestone, and especially the contacts of the limestone with the shale; only locally is the vein found to leave the limestone and extend into the shale. Its general course is near true east and west, swinging more northwesterly as it enters Litigation hill. The dip is south, at an angle of 40 to 45 deg., comformable to the beds of the enclosing strata. The breadth of the fissure, and the ore as well, varies with the nature of the inclosing strata; where shale forms the walls, the fissure is contracted, opening out as the vein traverses the limestone, or follows the plane of contact of the limestone and shale. As far as explored, the fissure is 4 or 5 ft. wide, expanding in the orebodies and in favorable ground, to a breadth of 25 to 30 ft. It is seen that whatever may have been the width of the fissure when originally formed, the expansions of the vein have been caused by the water, which deposited the quartz and associated minerals, eating out the walls and converting the rock adjacent to the fissure into ore. The size of the vein is thus dependent upon the composition and nature of the special stratum of rock traversed, being largest in soft crystalline limestones, rapidly dissolved by the mineral-depositing waters, while in hard dense rocks, high in silica and containing little lime, the vein is narrow, no wider than the fracture, for in such places the waters circulating through the fissure had but slight effect upon the walls. Commonly in depth, the gangue or vein rock is dark, bluish-gray quartz; near the surface it oxidizes to a rusty-brown quartz, colored by the

NOTE—Taken from report of April 2, 1909, on the property of the Manhattan Consolidated Gold Mines Company of Nevada.

*Mining engineer, Salt Lake City, Utah.

large proportion of iron in the ore. It is largely the result of the replacement of the lime-shale and limestone, by the up-flowing heated waters depositing silica; the rock being converted particle by particle into hard, crystalline quartz; as a particle of lime was dissolved, a particle of silica took its place, a process somewhat like the silicification of wood, buried in volcanic-ash or gravel beds, in its gradual alteration to agate. The intense dynamic movement creating the fissure, crushed and ground the rocks between the walls to a fine, angular breccia; subsequently, in the deposition of the ore, this brecciated material was completely silicified, the rock fragments being altered to dark quartz, cemented by a matrix of lighter colored crystalline quartz. Thus in some parts of the vein, the material filling the fissure was in great measure produced by the grinding of one wall upon the other during the fault-movement, and subsequently silicified. In other places the limestone included in the lode still preserves its bedded structure, notwithstanding that the rock has been changed to quartz; especially is this true where the silicification has extended beyond the walls of the original fissure. At the Earl incline on Litigation hill, and in the surface workings on an extension of the vein into the Silver Pick ground, the fissure is regular in width, with smooth or polished walls. The vein rock is also different, being white crystalline quartz, often cellular and crumbling from the oxidation and removal of the pyrite; a mineral structure frequently seen in fissure veins.

Deposition of the Ore

In the deposition of the minerals, at first quartz alone was formed; but as the mineralization proceeded, gold and the associated sulphides, pyrite, arsenopyrite, etc., were deposited together with quartz. Two distinct periods of ore deposition may be distinguished; the early silicification, with the precipitation of the included suphide, and a late mineralization forming high-grade gold quartz in the cross-fissures and enriching the orebodies in the east and west lode at the crossings, or places of intersection. The early deposition took place through the east and west fissure, the up-flow of a large volume of heated waters forming the great masses of quartz in the lode; the more recent enrichment occurred through the cross-verticals, the minerals being brought up from below by the intensely heated vapors and emanations, that deposited quartz and fluorite, with free gold. Owing to the nature of this later ore formation, the quartz deposited at that time is relatively small in quantity compared with the earlier formed bodies of quartz; but is remarkably rich in native gold. Beautiful specimens of crystallized gold, fluorite and quartz are found in these north and south fissures at Litigation hill. Some of the larger verticals carry gold, sufficient to pay for extraction across the breadth of the zone of limestone and shale. The larger deposits of gold quartz, however, occur in the east and west vein where it is crossed by these verticals. Not only is the orebody enlarged at such spaces of intersection, but the content of gold is notably increased. Further the pitch of the ore, or the inclination of the shoot, in its descent in the lode, is seen to conform to the inclination of the common line of intersection of the two systems of fissures.

The breadth of the mineralized zone of interbedded limestone and calcareous shale has not been determined by exploration; a single stratum of limestone is crosscut in the Consolidated mine workings for 100 ft.; along the crest of Litigation hill, the outcrop measures more than 250 ft. in width.

Most interesting is the part played by the limestone in the deposition of the ore; great masses of limestone have been dissolved by the heated waters and vapors, and the substance of the rock carried away in the run-off, where the lode broke to the surface. The chemical activities set free in the creation of the orebodies have removed the soluble lime and formed quartz in its place. In truth it may be said that the lime of the country rock has precipitated both the metals and the gangue. For this reason ore deposits are largely confined to the zone or belt of rocks containing an excess of lime. Further, the principal fissures course easterly and westerly and conform more or less perfectly to the bedding of the limestone and shale. Another reason is that the fissures are tight and pinched to a thin seam, in traversing the quartzites and silicious shale; but open out in the limestone. Within the lime zone the fissures are enlarged by the circulating waters attacking and eating away the walls; even the narrow verticals are enlarged in this way, and in favorable places carry workable ore deposits.

The union of these systems of fissures, the east and west master-fissure with the cross-verticals, together with their intimate association with the belt of limestone and shale, has made the great mineral zone or lode, traversing the Manhattan Consolidated ground. How the large bodies of gold-bearing quartz in this lode were deposited at an early period, and at a later date reinforced and enriched by a second mineralization, has been described. The lode or mineral zone extends through the full length of the Silver Pick claim, a distance of 925 ft.; in its descent into the ground, the dip of the lode, which is to the south, is largely covered by the Keystone and Red Boy claims.

The Ore Deposits

Wonderfully varied are the forms in which ore deposits are found in limestone. The controlling conditions are observed to be the permeability of the rocks, dependent upon the degree of disturbance and fracturing that they have undergone, and their relative solubility in the solutions and gases that brought in the minerals. In hard, difficultly soluble rocks, the ore is confined to the fissures and does not extend into the walls; under such conditions the deposits occur in shoots, like those of fissure veins. In soft, easily soluble limestone, crushed by even small crystal-movements, the fissures are more or less enlarged by the solvent action described, and the ore makes into the walls; local expansions are often produced by the intersection of the master fissure by cross fissures, which shatter and break up the beds, admitting the free and wide spread circulation of the depositing waters; which, introduced through an open crevice, escape and penetrate the adjacent strata. In some instances, great blocks of limestone are crushed and brecciated by some dynamic movement of the earth's crust, and such breccia masses, penetrated by the fissures and cross fissures, were converted into bodies of ore by the slow and long continued circulation through the interstices in the crushed rock, of a vast volume of mineral-bearing waters that dissolved and carried off the lime in solution and deposited the ore in its place. The size of the orebody produced was limited only by the extent of the brecciation within the zone, the volume of the mineral-forming solution and duration of its flow. Ore formations of this kind merge into chamber deposits; the ore filling cavernous spaces eroded in the limestone.

Owing to concentrative deposition in the lode, around centers of upflow of the mineral-forming waters, and to the nature of the chemical processes involved in their generation, deposits in limestone, though so varied in form, are characterized by clean and often large bodies of ore of uniform grade. When the deposits are of large size, the work of extraction may be planned in advance, with substantial reduction in cost; even where the ore is confined to the fissures, it is cheaply mined.

By the decree of April 30, published in the *Diario Oficial* of May 12, 1909, the importation of machinery, implements and materials for the prospecting and exploitation of mines and the installation of metallurgical works in Uruguay is made free of duty for a period of 10 years. Persons desirous of taking advantage of the above concession must apply to the executive, indicating the character and quantity of the materials to be imported. The cost of verifying the above information is to be charged to the importers.

In 1908 the North American Lead Company, of Missouri, began producing cobalt oxide and turned out, according to THE MINERAL INDUSTRY, about 100,000 pounds.

The Position of the Electric Furnace

By P. McN. Bennie*

This paper reviews in general the progress and present position of the electric furnace in the manufacture of iron and steel. The conclusions arrived at are of interest.

Uses of the Electric Furnace

First, as to high-grade steel, the electric furnace is rapidly becoming a serious competitor of the crucible method, for the simple reason that it is less expensive. Against a high cost of labor, crucible renewals and the fact that steel must be melted in small units, we have a lower labor cost, small cost for refractories, and the possibility of handling several tons of metal of uniform composition.

Second, as to steel for structural and rail purposes, the electric furnace is so far only asking recognition as a useful adjunct to existing apparatus, for doing additional refining or treatment in an economical and expeditious manner. Not a rival, but an ally, in the general siderurgical scheme.

Third, for steel castings the electric furnace cannot compete with open-hearth castings, but for a grade somewhat better, where additional refining would be required, the electric furnace has decided advantages. For castings of crucible quality the electric-furnace methods will give satisfactory results at less cost than crucibles. In addition, for heavy castings the larger quantity of metal which can be treated as a unit is of much importance.

Temperatures and Quality

It is undoubtedly a fact, to which all who have seen an electric-steel furnace in operation will bear witness, that higher temperatures are at the command of the metallurgist than heretofore. Generally speaking, refining operations can be carried on more rapidly and thoroughly with higher temperatures. Whether any substantial good is accomplished by additional refining, must be left to the steel makers, when they shall have come to agreement among themselves as to that point. I heard it said recently by a metallurgical engineer that product with just as good analysis could be made in any ordinary furnace as in the electric furnace. The truth of this contention is granted, but not the implied conclusion that analysis is the whole story. Given a choice between two steels of identical price and analysis, one of which is known to be the product of the crucible process and the other of the open-hearth process, would any engineer hesitate?

As to the electric furnace, if it can produce an improvement in quality, worth more than the increased cost, its future is assured. All electric steel furnaces work under basic conditions, even those used for tool steels. It has been found in Germany, for example, that steel is improved by simply putting it into an induction furnace, leaving it there for an hour or two, without attempting any refining by slags, meanwhile supplying only sufficient energy to maintain the temperature. It is believed that this gives dissolved gases an easy opportunity to escape.

Probable Improvements

To sum up, the following improvements in electric furnaces may be looked for:

1. Electrodes of larger size and quality that will reduce the present consumption per ton.

2. Refractory materials superior to those now in use, and probably themselves the product of electric furnaces, such as fused alumina and other refractory oxides. In electric furnaces where an arc is present there is considerable vapor formed by volatilization of silicon, calcium, calcium oxide and even iron itself, which vapors are very active chemically, attacking the walls and roofs of the furnace. The destruction of the roof in electric furnaces is probably due as much to these vapors as to the high temperatures.

3. Increase in size and capacity of furnaces. Keller can now build furnaces for treating molten steel with a capacity of 10 to 12 tons. Robert Turnbull, Dr. Heroult's engineer, is confident that 15-ton furnaces present no difficulties whatever.

Production

For the first time electric-furnace steel was reported in the German returns of production for 1908. The amount was 20,000 tons. When it is considered that electric furnaces charged with molten metal are good for 10 heats daily it will be seen that with a total daily capacity of from 100 to 150 tons of steel the electric furnace may fairly be said to have emerged from the metallurgical nursery.

NOTE—Abstract of paper read before the Engineers' Society of Pennsylvania; published in the *Iron Age*, New York.

*Metallurgical engineer, Niagara Falls, N. Y.

Rhodesia and the Chartered Company

Special Correspondence

The report of the British South Africa Company for the financial year ended March 31, 1908, records an improvement in the condition of Rhodesia, and is the most favorable report that the company has yet issued. In southern Rhodesia for the first time the administrative expenditure has been met by the revenue, a small surplus being shown in the accounts. The provinces of Northeastern Rhodesia and Northwestern Rhodesia are administered at a loss. The Chartered Company had to provide £280,000 for interest on the debentures of railway companies, but it is anticipated that for the year ended March, 1909, the net shortage owing to increased traffic will not exceed £180,000.

Arrangements have been made for the main line from the south to be extended to the Congo frontier and for an extension to the Star of the Congo mine. The second mortgage debenture stock offered to the shareholders in March, 1908, was subscribed for to the extent of £981,069. An application made to the Imperial Government for relief in connection with the financing of new railways was refused. In the memorandum submitted to the Imperial Government by the British South Africa Company, attention is called to the large sums that have been spent by the Chartered Company and its allied railway companies in opening to civilization a large area of Africa which, 20 years ago, was in a state of barbarism. The British South Africa Company has spent £11,000,000 of capital, and the railway companies about the same amount, so that altogether the cost of conquering and civilizing Rhodesia has been about £22,000,000.

A favorable report in the report is the statement that there has been a net increase of 1100 in the European population since the census of September, 1907, when the number of Europeans was 14,018. The company sent representatives to the South African National convention to discuss unification with the four self-governing colonies: Cape Colony, the Orange River Colony, Natal and the Transvaal. Provision was made in the draft of the bill to be submitted to the Imperial Parliament for the inclusion of Rhodesia in the union at some later period.

Protective Screen for Zinc Furnaces

Emile Dor-Dellattre proposes in U. S. Pat. 921,375, May 11, 1909, an arrangement for protecting operatives of zinc and analogous furnaces from heat, fumes and dust, without impeding the progress or rapidity of the operations. A movable screen is used with several panels, each being formed of three thicknesses of sheet iron; between the first and second plates is a layer of hard asbestos, and between the second and third is an air space. The screen is raised by a hydraulic ram, and by inserting steel pins in the furnace frame through the holes in the panels, any row of retorts can be uncovered while all the others remain covered. Above the movable screen is a fixed screen, behind which the former can be raised. When the movable screen is lowered, the space at the back of the fixed screen is connected with an exhaust system for the withdrawal of fumes, dust, heat, etc.

New York produced 70,739 short tons ($697,390) of fibrous talc in 1908.

New Publications

PROCEEDINGS OF THE AMERICAN MINING CONGRESS, ELEVENTH ANNUAL SESSION, 1908. Pp. 268. 6x9 in.; paper. Denver, 1909: American Mining Congress.

SECOND ANNUAL REPORT OF THE RAILROAD COMMISSION OF WISCONSIN, FROM JUNE 30, 1907, TO JUNE 30, 1908. Pp. 1229. 6x9 in.; cloth. Madison, Wis., 1908: Railroad Commission of Wisconsin.

BIBLIOGRAPHY OF THE GEOLOGY, MINERALOGY AND PALEONTOLOGY OF BRAZIL. By John C. Branner. Bull. of the Geological Society of America, Vol. 20. Pp. 132. 7x10½ in. New York, 1909: Published by the Society.

SUMMARY REPORT OF THE GEOLOGICAL SURVEY BRANCH OF THE DEPARTMENT OF MINES FOR THE CALENDAR YEAR 1908: Sessional Paper No. 26. Pp. 220. 6½x10 in.; paper, 15c. Ottawa, 1909: Printed by C. H. Parmelee.

MINERAL RESOURCES OF THE KOTSINA-CHITINA REGION, ALASKA. By Fred H. Moffit and A. G. Maddern. U. S. Geological Survey, Bull. No. 374. Pp. 103, illustrated. 6x9 in.; paper. Washington, 1909: Government Printing Office.

RESULTS OF PURCHASING COAL UNDER GOVERNMENT SPECIFICATIONS. By John Shober Burrows; with a Paper on Burning the Small Sizes of Anthracite for Heat and Power Purposes. By Dwight T. Randall. U. S. Geological Survey, Bull. No. 378. Pp. 44. 6x9 in.; paper. Washington, 1909: Government Printing Office.

SOME CENTRAL IDAHO GOLD DISTRICTS. By S. P. Jellum. Pp. 84, illustrated. 7x9½ in.; paper, 50c. Spokane, Wash., 1909: The Northwest Mining News.

Contents: Early discoveries. Geography, Topography and Geology. Lolo Mining District. Pierce City District. Newsome District. Elk City District. Oro Grande-Fourmile District. Buffalo Hump District. Dixie Mining District.

INVESTIGATION RELATING TO IRON AND MANGANESE BY THE UNITED STATES GEOLOGICAL SURVEY IN 1908. By E. F. Burchard, E. C. Harder and Sidney Paige. U. S. Geological Survey, Bull. No. 380-E. Pp. 115, illustrated. 6x9 in.; paper. Washington, 1909: Government Printing Office.

Contents: Estimates of Clinton Iron Ore in the Chattanooga Region. Taylor Peak and White Pine deposits, Colorado. Hanover deposits, New Mexico. Iron Ores of the Appalachian Region in Virginia. Manganese deposits of the United States. List of Survey publications.

PAPERS AND REPORTS RELATING TO MINERALS AND MINING. Pp. 164, illustrated. 8¼x13 in.; cloth. Wellington, 1908: John Mackey, Government Printer.

Contents: Statement by the Minister of Mines. Report on the goldfields. Report on coal mines. State coal mines. Features of special interest and electrical installations at mines in New South Wales and Victoria.

THE AMERICAN FERTILIZER HAND BOOK, 1909. Pp. 247; illustrated. 8x11 in.; cloth, $3. Philadelphia, Penn., 1909: Ware Brothers Company.

Contents: A classified list of Fertilizer Manufacturers, Phosphate Miners, Sulphuric Acid Plants, Brokers, Chemists, Lead Burners, etc., and Cotton-seed Mills. State Fertilizer Laws Governing the Manufacture and Sale of Commercial Fertilizers. Sulphuric Acid Tables, conveniently arranged. Patents issued during 1908 Pertaining to the Fertilizer Industry. The Nitrate of Soda Industry, (illustrated). Conclusions Reached with Raw-rock Phosphate Experiments. Potash Salts Statistics. Manurial Effect of Calcium Cyanamide under Different Conditions. The Fertilizer Materials Market, and other Practical Information.

THE MINE INVESTORS' GUIDE. By Floyd Davis. Pp. 168, illustrated. 5½x7½ in.; cloth, $1.50. Des Moines, Iowa, 1909: The Western Correspondence School of Mining Engineering.

Contents: The frenzied days of placer mining. Gold and silver mining in the United States. Influence of mining in developing the country. Fortunes and failures in mining. The sedimentary rocks and their ores. Igneous rocks. Origin and occurrence of valuable metals in fractured rocks. Composition, distribution and production of principal ores. Structure of ore deposits. Economic mining of coal. Examination of mining properties. Valuation of mines. Mining investments.

OFFICIAL YEAR BOOK OF THE COMMONWEALTH OF AUSTRALIA. Statistics for Period 1901-1908. By G. H. Knibbs. Pp. 1159, illustrated. 6x10 in.; board covers. Melbourne, 1909: Commonwealth Bureau of Census and Statistics.

This bulky publication—unlike some other statistical annuals—covers very fully the ground suggested by its title. It gives full statistics with regard to population, vital statistics, lands and land tenure, agricultural and pastoral production, forests, fisheries, mines and mining, manufacture, commerce and means of intercommunication. To these are added important sections on the government, both Commonwealth and local and all the governmental activities, including finance. Almost any statistics which are desired can be found in this volume by those interested. Necessarily the chapter on mining is limited on account of the space taken up by the other statistics, but it covers 40 pages and gives a good condensed summary. To the general reader, who is not perhaps so much interested in statistics, the greatest interest will be found in the opening sections which give a condensed history of the discovery and colonization of the Island Continent and an account of the more recent federation of the different Colonies—or States as they are now called—into a single commonwealth. The second section of the introduction gives an account of the physiography of Australia, its geography, geology, climate and the fauna and flora. This is quite as interesting as the historical section.

SUMMARY REPORT OF THE GEOLOGICAL SURVEY BRANCH OF THE CANADIAN DEPARTMENT OF MINES FOR 1908. Pp. 220; 9½x6½ in. Paper. Ottawa, 1909; (?) King's Printer.

This volume, comprising the results of the operations of the Survey during the season of 1908 in nearly every province and territory of Canada, contains much information of practical importance and interest to mineralogists and all concerned in mining, in addition to its scientific value. Director R. W. Brock calls attention to the need of coöperation between the Survey and the provincial governments in topographical work and other branches, and points out that in view of the demand for men of trained technical ability by private corporations and colleges the salaries of the staff must be largely increased, if its efficiency is to be maintained. Among the more important of the reports of explorations, from an economic point of view, are those of D. D. Cairnes on the district in the Yukon between Whitehorse and Tantalus; W. W. Leach on the coal deposits of the Bulkley Valley, B. C.; R. G. McConnell on the northwestern part of Texada island, B. C., where valuable iron deposits occur; O. E. Le Roy on Phœnix camp, B. C.; D. B. Dowling on the coalfields of Alberta and Saskatchewan; G. S. Malloch on the Big Horn coal basin, Brazean river, Alberta; R. W. Ells on the oil shales of New Brunswick and Nova Scotia. A branch of the Survey to take up the subject of underground water and deep borings for natural gas, oil, etc., has been formed in charge of E. D. Ingall, who reports the steps which are being taken to keep in touch with those engaged in drilling and to secure their coöperation in the collection of records. Robert A. A. Johnston notes the increasing demand from colleges and other educational institutions for the collections of mineral and rock specimens supplied by the Survey.

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

Arthur S. Dwight has returned to New York.

Franklin W. Smith, of Bisbee, Ariz., is visiting New York.

W. H. Shockley has sailed for London, where he intends to make his future headquarters.

J. V. N. Dorr has returned to Denver after spending four weeks in New York and vicinity.

Horace V. Winchell returned to Minneapolis, Minn., on June 26 from a three-months' trip to Europe.

Wm. A. Paine, president of the Copper Range Consolidated Company, is a visitor at the properties in the Lake Superior region.

Samuel Franklin Emmons received the honorary degree of doctor of science at the commencement of Harvard University last week.

James J. Mahon, consulting engineer of the Crucible Steel Company, of America, Pittsburg, sailed for Europe June 30, on a business trip.

F. B. F. Rhodes, assistant manager of the United States Zinc Company, Pueblo, Colo., has severed his connection with that company and is open for an engagement.

William C. Baar, secretary of the Ideal Mining Company, left Indianapolis July 6, in company with several directors on a visit to the mine at Custer, South Dakota.

E. E. Henner, of the Oliver Iron Mining Company has been made chief engineer at Duluth. He is succeeded as engineer of the Hibbing district by Wm. M. Tilden.

Jules Schirmann and L. Coin, of Schneider & Co's. steel works, Creusot, France, who have been visiting manufacturers in this country the past four weeks, sailed for Europe June 24.

H. R. Robbins, of New York and Seattle, has been appointed managing engineer for the Colonial Gold Mining Company, and has taken charge of its mining operations at Kerameos, British Columbia.

Professor John J. Porter, of the University of Cincinnati, recently returned from a three weeks' stay in the Birmingham district, where he has been conducting a furnace test of the Heacock mountain gray ore of the Alabama Ore and Iron Company.

W. W. Graff, who has been superintendent of the Cleveland Cliffs Iron company's Cliffs shaft and Moro mines for the past five years, is to be transferred to the company's new North Lake mine. He will be succeeded at Ishpeming by Lucion Heaton, who has had supervision of the company's Iron Belt mine on the Gogebic range.

S. T. Lockwood, of Buffalo, N. Y., an expert in rare minerals, recently visited Gilpin county, Colo., in order to obtain pitchblende or uranium ore for the purpose of experimenting on the extraction of radium, the experiments to be conducted at the Colorado School of Mines at Golden, through the Vinson Walsh research fund, the gift of Thomas F. Walsh, of Denver.

Obituary

Robert Dun Rhodes, a graduate of the School of Mines, Columbia College, and for years superintendent of large works at Bingham, Utah, died June 26 instantly of Bright's disease. He will be mourned by a host of his mining friends.

James H. Blackburn, for many years a leading business man in Blair county, died at Williamsburg, Penn., last week, aged 81 years. He was long engaged in mining and shipping coal, ore and limestone, and for more than 25 years conducted large operations in various parts of Blair county. He was the father of W. W. Blackburn, secretary of the Carnegie Steel Company.

As a result of being thrown from his horse while riding along the Beverly shore road, Robert D. Evans, owner of the Stetson house at Beverly, occupied by President Taft and family, died at the Massachusetts Homeopathic hospital in Boston, July 6. Mr. Evans was 67 years of age, and was one of New England's wealthiest men. It was only in the last 10 years that Mr. Evans has been identified with mining interests, in which he had amassed the greater portion of his wealth, which is estimated at $12,000,000. Previous to that time he was chiefly identified with the rubber industry, having organized the American Rubber Company of Cambridge, which went into the United States Rubber Company. He was the first president of the rubber trust. After his retirement from that company he became interested in the United States Mining Company. When the company was passing through financial difficulties in 1899 he purchased large blocks of the stock under $10 per share and assumed the presidency, and at the time of his retirement from the successor company, the United States Smelting, Refining and Mining Company, a few months ago, because of ill health, he had accumulated 150,000 shares of common and preferred. His other large mining enterprise was the Yuba Consolidated Gold Mines Company, a gold-dredging proposition in California, capitalized at $12,000,000. He organized this company, built 12 large dredges, at a cost of about $1,500,000, and has been receiving for two years $650,000 a year in dividends from a 65 per cent. stock ownership. He has been receiving an annual income of about $1,000,000 from the above two properties. He has other large investments in mines, rubber plantations and manufacturing companies. His collection of paintings, including many of the old masters and said to be one of the finest in the country, is valued at over $1,000,000.

Samuel Francis Luty, for many years the esteemed and trusted Pittsburg correspondent of the JOURNAL, died in Pittsburg, July 5, after a long illness. Mr. Luty was born in 1860 in Allegheny, and was educated at the Fifth Ward school and the Western University of Pennsylvania, now the University of Pittsburg. About 30 years ago he entered the newspaper business as a reporter on the *Allegheny Mail,* and soon gained a reputation as a news gatherer. After leaving the *Mail* he became a reporter on the old *Chronicle,* and there first took up the branch of work of which he later made a specialty, that of labor reporter and editor. He had few equals in this department of news, and was especially noted for his understanding of the intricacies of wage scales. His services along this line brought him into contact with manufacturers, mine operators and other business men in all parts of the country, and he was equally well known among the labor leaders and general workers in city, State and National organizations. His first work as labor reporter was during the big puddlers' strike in 1882. In 1884, Mr. Luty went to the *Dispatch,* remaining with that paper until 1889, when he was appointed assistant secretary of the American Tin Plate Association. The association, its object attained, was dissolved in January, 1891. Mr. Luty then went to the *Chronicle Telegraph.* Early in 1906 Mr. Luty resigned to take the position of associate editor of the *Industrial World,* which position he was occupying at the time of his death. He also acted as Pittsburg correspondent of several trade publications in other parts of the country. He was noted for his literary tastes and took great pride in his library. He leaves his widow, who was Miss Annie Jackson before her marriage; one daughter, Mrs. Frank Moore, of the North Side, and two sons, William Porter, with the H. C. Frick Coke Company, and Harry, with the Carnegie Steel Company.

Societies and Technical Schools

Lake Superior Mining Institute—The 14th annual meeting will be held on the Marquette range, beginning Wednesday, Aug. 25, and continuing until Saturday, Aug. 28. Headquarters will be in Ishpeming. Excursions will be arranged for the entertainment of members and guests, and local committees are preparing a program and itinerary. A number of papers have been promised. The officers of the institute are M. M. Duncan, president; A. J. Yungbluth, secretary, Ishpeming; E. W. Hopkins, Commonwealth, Wis., treasurer.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at San Francisco, Butte, Denver, Salt Lake City, Goldfield, Colbalt, London

REVIEWS OF IMPORTANT EVENTS

San Francisco

July 1—The dredge operators in Yuba county have been given a setback by the court deciding that the law is valid which prohibits hauling over 3500 lb. over the county roads in one vehicle during the winter and spring months when the roads are wet. Nine teamsters employed by the dredge and manufacturing companies were arrested for hauling loads exceeding the limit and fined $50 each. One case was appealed to the Supreme Court and decided adversely to the teamsters. In the manufacture of heavy dredging machines at Hammerton, large pieces of machinery have to be handled. The law was formed long before there was any idea of such a class of work being done in the county. The manufacturers claim that they cannot run the factory unless they are permitted to haul heavy pieces over the roads. They may, therefore, have to remove their factory for dredge machinery to some other place.

To guarantee a bond issue of $25,000,000 a deed of trust has been placed on record by which the Netomas Consolidated Company of California hypothecates all its holdings in Butte, Sacramento, and Eldorado counties to the Mercantile Trust Company of San Francisco. This is the result of the merger of a number of dredging companies, made last winter. This money will provide new dredges, develop power, and purchase dredging land. The company already owns numerous dredges at Folsom and Oroville, and is building others. Among the purchases made by the company is the property of the Feather River Exploration Company. The shops of the latter company are to be moved from Dredgeville to Corona Terrace, below Oroville.

Since the compromise was effected between the city of Oroville and the Indiana Dredging Company, by which the dredge people agreed to level off the tailing piles, to repay costs of suit, and do other things the city trustees advised, other communities along the Feather river are seeking similar advantages. The State engineer does not consider the Oroville settlement as satisfactory.

The California State Mining Bureau is issuing a series of maps of the mining counties of the State, showing the boundaries of the national forests.

Butte

July 1—In the case of F. A. Hall against the Yellowstone Park Railroad *et al.* Judge Hunt has appointed H. L. French and H. Maguire receivers for the defendant road. The suit was brought to recover $30,000 alleged to be due Hall for services rendered and money advanced to the company. In his complaint Mr. Hall alleges that there is a conspiracy to defraud him of his interest in the company. The appointment of two receivers was in the nature of a compromise, one being given to each faction interested. The road operates between Bridger and Bear Creek in Carbon county.

The Raven Mining Company, through its president, E. C. Frisbie, has issued another circular letter to its stockholders reminding them of the necessity of taking active steps to protect their interests. The letter states that a new company, known as the Raven Copper Company and capitalized at $1,000,000 with shares of the par value of $1 each, has been incorporated under the laws of Maine. The new company proposes to acquire the property of the old, assume expenses of the maintenance of the property from June 1, 1909, and place $50,000 in the treasury. Stockholders in the old company are to be given the opportunity to purchase shares in the new on the basis of surrendering one old certificate and paying 25c. for each new one issued. The payment is limited in time to July 19, 1909.

Bruce Blake, receiver of the bankrupt Idaho Smelting and Refining Company, has filed a report with the referee in bankruptcy showing the company's liabilities to be $501,559 and its resources $222,244. The liability on open accounts alone amounts to $219,398, the largest individual account being in favor of the Fidelity National Bank of Spokane and the First National Bank of Ponderay, Idaho, and amounting to $71,280. The first meeting of creditors will be held on Aug. 2, instead of earlier as previously arranged.

Denver

July 2—That portion of the Ouray mining district which lies below the town, at elevations of from 7000 to 9000 ft., and which is free from the snow, is extremely active. The silver-bearing veins, such as the Wedge, Neodesha, Bachelor and Calliope, which are fissures in the sedimentaries, are all doing diligent exploration for new orebodies, as are also the Black Girl and Pony Express, in the limestone, these two, however, being in ore. The American Nettie, in the quartzite at the top of this geological section, is ready to ship and the Savage Bear Company up Bear creek, east of the town, has been cleaning out the old tunnel workings, and reports the discovery of high-grade ore in the breast 300 ft. into the mountain, and 100 ft. below the outcrop. The fact that so many of the early day bonanza mines are being reopened augurs well for Ouray in particular, and the San Juan in general.

In the Red Mountain district, outside of the Carbon Lake mine, owned by the San Antonio company, and described in the JOURNAL of May 1, 1909, the district from Ironton to Red Mountain town has for years been largely dependent upon the movements of Mr. Crawford, who originally brought the district into notice about 1883, when he negotiated the purchase of the Yankee Girl and Robinson by Eastern capital, and has now projected a long tunnel (which is partially constructed) to cut this group and the Gennessee-Vanderbilt at greater depth. It is reported that he is on his way here now with a party of Eastern capitalists, and that all outstanding indebtedness will be paid and work recommenced. That there are still big mines in this area, miners and engineers knew, but it is hard to interest capital in a mining camp which shows moss-grown dumps, tumble-down buildings and deserted shacks. The Koehler tunnel, to cut the Carbon Lake vein at depth, is expected to reach the oreshoot about the middle of this month. It is now in 2150 feet.

It is reported in the local press under big headlines that the competition for Cripple Creek ores may end in a merger, i.e., that the American Smelting and Refining Company has absorbed the Golden Cycle plant at Colorado City. There is absolutely no truth whatever in it, and in certain circles it is regarded simply as a very ingenious method of letting the public know that this valuable property is for sale. The Golden Cycle mine is probably today the biggest and best mine in the Cripple Creek district, for the production for the last month is given at 6500 tons of good grade gold ore, and 1000 tons from the Christmas mine on the same vein were hoisted through the Golden Cycle shaft.

The Blue Bird mine on Bull hill, is under lease and is shipping high-grade ore, as is also the Ruby, adjoining. The production of the district for the first six months of 1909 is given at 357,703 tons of gold ore, of a bullion value of nearly $8,000,000. The dividends paid in June by four companies alone amounted to $92,200. The Gold Dollar Consolidated

will pay $12,500 on July 10. The Mary McKinney Company, which paid $26,000 in dividends last month, sends a statement to shareholders which shows shipments for the past year of a total gold bullion value of $86,000, net income $55,626, with cash in hand of $90,840. These are wholesome statements that go far to encourage and increase the mining industry of the State.

Goldfield, Nevada

July 1—Friday, June 26, every mine in Goldfield depending on the Nevada-California Power Company for electric power, was shut down. A freshet destroyed the diverting dam at plant No. 2 at Bishop, Cal., and the ditches at plants No. 4 and 5 were choked with débris. Saturday afternoon service was resumed.

A compromise was effected by which the Florence Goldfield Mining Company paid $10,018 in settlement of bullion taxes and penalties claimed by the State, and indictments against the company were quashed.

The rate war between the Santa Fe and Southern Pacific and Tonopah & Goldfield railroads has been terminated in such a way as to benefit both Goldfield and Tonopah. By the new arrangement the Tonopah & Goldfield with service over the Southern Pacific and Pennsylvania systems will be able to deliver supplies to Goldfield in about half the time formerly required.

The official report of the Goldfield Consolidated Company for the month of May shows that 21,630 tons of ore valued at $762,748 were produced. The average cost per ton for mining, milling, transportation, etc., was $6.117.

Shipments, to the mills, from Tonopah for the week ending June 26 were: Tonopah Mining, 3300 tons; Belmont, 750; Montana-Tonopah, 953; Midway, 100; MacNamara, 300 and West End, 85; making a total of 5488 tons, $137,200 being the estimated value.

Salt Lake City

July 2—Emma Copper is getting to be a live issue. While comment has been rather harsh and bankruptcy proceedings have been threatened, action is expected by the shareholders in the near future that will bring this property into prominence again. At one time the Emma Copper was counted one of the big things in the Alta district and report was made that big improvements and development work would be done with money secured from the sale of stock to Samuel Newhouse, D. C. Jackling and other big operators but what was done with the money has not been disclosed. Mr. Jackling and Mr. Newhouse deny the report that they had sold their stock on the advance and claim to still have their allotments of stock in their possession.

In connection with the plan of reorganization of the Newhouse Mines and Smelters Corporation, it is stated that about 90 per cent. of the bondholders and about three-quarters of the shareholders had signified their intention of coöperating with the reorganization committee. As a large number of shares of this stock are held in Europe, the committee will allow a reasonable time for these shareholders to be heard from. It is understood that the Macquisten tube concentrators, operating on the principle of surface tension, are to be installed for treating the tailings. In a report made by E. P. Jennings, of Salt Lake, for the reorganization committee, he estimates the following assets in ore: Ore in sight, 1,127,083 tons averaging 1.8 per cent. copper; partly developed and probable ore, 1,000,000 tons of 2 per cent. tenor, partly exposed by surface outcrops and developments on the 400- and 500-ft. levels; partly developed ore west of ore shoot, 1,000,000 tons containing from 1 to 1¼ per cent. copper; possible ore, 500 ft. in length of undeveloped territory on the west end of the Cactus ground. Mr. Jennings estimates a cost of 11.39c. per lb. of copper based on an output of 25,000 tons of 1.8 per cent. ore per month, with present cost of mining and milling and a production of 12.9 per cent. concentrate, with 80 per cent. recovery in the mill.

With the further development of the modified caving system of mining, and an output of 30,000 tons per month, with 80 per cent. recovery in the mill, he estimates that copper can be laid down in New York for 9.46c. per lb., exclusive of the cost of selling and New York office expenses, which would add about 0.2c. per lb. of copper. In this latter estimate, mining is figured at $1 per ton, milling at 45c., and miscellaneous expenses at 10c. per ton. By the use of the modified caving system of mining, the cost of mining has already been reduced from $2.40 to $1.25 per ton; milling costs have been 55c. per ton. The mine at present has two vertical shafts to the 600-ft. level, and an incline from the 600- to the 900-ft. level. Mr. Jennings recommends the sinking of the shaft from the 600- to the 800-ft. level and believes that the company should derive a profit of 3c. per lb. at the present market price of copper, if operations are conducted with ordinary business and technical ability.

Cobalt

July 2—A new vein has been cut at the Big Pete mine of the Cobalt Central. It was found on the 360-ft. level in the crosscut about 300 ft. north of the shaft. The vein matter consists of calcite, smaltite and native silver. The crosscut is being driven to tap a vein formerly located by the diamond drill. The find was made in the Huronian slates, which underlie the diabase. The Foster has been diamond drilling to locate the same formation. They succeeded in getting it, but the drill passed through the Huronian into underlying Keewatin.

The first year of La Rose Consolidated has ended and for that period the company produced a total of $1,575,493. The total expenses for the year were $481,921. This leaves a net profit of $1,093,572. The production was 3,010,531 oz., as against a total previous production of 2,675,161 ounces.

The preliminary surveys for the extension of the Temiskaming & Northern Ontario Railway from Charlton to Gowganda have been completed to a point within five miles of the latter place. The government engineers are making exhaustive inquiries into the possibilities of the country, in order to ascertain the amount of traffic there is liable to be. So far no reports have been issued and it is not likely that any decision will be arrived at before the end of August. The road would be about 48 miles long and the cost is estimated at $2,000,000. The location surveys have been completed as far as Elk lake.

At the Nova Scotia mine, development is being carried on in a vigorous manner, with the object of increasing the ore reserves sufficiently to warrant the erection of a concentrator. Plans and specifications for the mill have been completed and the estimated cost is $100,000. At the present time the No. 3 shaft is being changed to a double compartment. This shaft will be used for hoisting only. A new hoist with a capacity of 1000 ft. is being installed. The lowest level is 240 ft. from the surface and at this depth on No. 2 vein a winze is being sunk. The veins of this mine are wide, but low-grade and suitable only for concentrating.

The Cobalt Silver Prince mine, which is near Cross lake is to open up again. This property, which adjoins the King Edward has not been worked for some time. There are two shafts on this property and strong calcite leads occur in the workings. No extensive operations will be undertaken until the hydraulic air is in the camp.

The Beaver mine is in good ore again. A winze was sunk on the vein. The plant, which was destroyed by fire some time ago is being rebuilt and when the mine is able to supply its own power, operations will be resumed on a larger scale. At present air is being purchased from the Temiskaming.

Toronto

July 2—The Canadian Department of Mines is devoting a good deal of attention to the subject of electric smelting, owing to the satisfactory accounts received from Sweden and Norway, as to the commercial success of the process on the lines laid down by Dr. Eugene Haanel, director of mines. The department has

received a letter from the British Ambassador to Sweden, stating that another commercial plant is being erected at Trollhatten Falls to consist of three furnaces, each of a capacity of 7500 tons of pig iron per year. The conditions of the iron and steel industry in Norway and Sweden being similar to those obtaining in Canada, especially in Quebec and Ontario, Doctor Haanel is encouraged to believe that electric smelting offers great possibilities for dealing with ores which cannot profitably be treated in the ordinary way. Ores are successfully smelted in Sweden by electricity containing from 0.4 to 1.9 per cent. phosphorus. To show the extensive field thus opened for development and stimulate inquiry by capitalists and manufacturers, the department has in preparation exhaustive reports on the iron ore deposits of the Gatineau and Ottawa valleys, and Thunder bay in Quebec and Ontario, and of New Brunswick and Nova Scotia. Many of these, while too high in phosphorus or too far distant from the coalfields to be available by the ordinary process are adjacent to extensive water powers which would furnish electric energy.

Some excitement has been caused by the reported discovery of extensive gold fields at Lac la Ronge, Saskatchewan, some 200 miles north of Prince Albert. The gold-bearing district is said to cover an area of 40 miles, and rich samples are reported to have been brought to Prince Albert by prospectors. The first discoveries in that district were made about a year ago, but on being assayed by the Geological Survey branch showed but little gold, so that the officials are disposed to be doubtful as to the value of recent finds. William McInnes of the Geological Survey staff, who reported on the previous discovery, has left for Lac la Ronge to make an investigation.

Mexico

June 30—The incorporation of a new company, with a capitalization of $75,000,000, to consolidate the Southern Pacific company's lines on the west coast of Mexico and for acquiring the property of the Cananea, Yaqui River & Pacific railroad, which company is to be known as the Southern Pacific Railroad of Mexico, directs fresh attention to affairs governing that portion of the company's already extensive system.

When completed the Southern Pacific company's Mexican line will extend from Nogales, Ariz., southwestward to Guymas, Mex., and thence southward to Mazatlan and Guadalajara, from which point the company will have trackage rights over the lines of the Mexican Central to the City of Mexico. Altogether, the company's lines will embrace between 1200 and 1300 miles of road. Of that portion of the line that is already completed 600 miles are now in operation.

It is understood that the cost of building the new Mexican line, when completed, will be in the neighborhood of $52,000,000 or $53,000,000, to which sum there should be added an additional $6,000,000 or $8,000,000 for a complement of equipment to take care of the large tonnage that is expected to develop. It may be stated that the country through which the company's line runs is rich in mineral products and, it is expected, within a short time will become an extremely productive agricultural center.

London

June 26—The directors of the Camp Bird mine in Colorado are considering the purchase of an important operating mine in Mexico which has been recommended to them by their consulting engineer John Hays Hammond. Some of the officials of the Camp Bird have gone to Mexico to make further examination and R. T. Frecheville, one of the directors of the company is also to pay a visit to the property. The directors have issued a circular to their shareholders saying that in order to be in a position to carry out the purchase, if the reports are favorable, some of the directors and their friends have entered into a conditional agreement to underwrite an issue of 280,000 reserve shares of Camp Bird, Ltd., arranging that an offer of them shall in due course be made to the shareholders.

The report of the directors of the Great Boulder Gold Mining Company, Ltd., for the year ending Dec. 31, 1908, has been issued. During the year 204,406 tons of ore were treated, realizing bullion to the value of £304,078. The profit, after deduction of administration charges in Australia and London, Western Australian government tax, depreciation on capital accounts, and expenditure on development work, amounted to £46,725. Adding to this the balance at profit and loss account at Dec. 31, 1907, there was a disposable sum of £91,253 out of which two dividends of 6d. each have been paid, absorbing £69,972. During the year the working costs have amounted to 19s. 4.654d. per ton, as compared with 18s. 2.059d. in 1907. The increase in working costs for 1908 has been mainly due to the fact that the method of stoping adopted has proved increasingly disadvantageous, but the difficulties experienced in roasting have also partly accounted for the higher costs, in addition to the increased cost of power and labor. The ore reserves are valued at 391,947 tons of ore averaging 6.58 dwts. per ton, valued at £547,093 and 218,440 tons of probable payable ore.

The London firm of Hooper, Speak & Williams was appointed as general managers from March 1, 1908, and Ernst Williams, the resident partner in Australia will carry on the superintendence. The general managers report that the feature of the year was the proving of the Lake View lode at the 1750- and 1900-ft. levels. It is apparent, they say, that more settled country prevails below the 1600-ft. level, and that the unfavorable zone between the 1100-ft. level and 1600-ft. level is giving way to better ore-forming conditions, where chances of richer ore may be expected to exist.

Johannesburg

The reef cut at 3754 ft. in the Turf Mines shaft has turned out to be some nondescript body overlying the south reef, while the true representative of this orebody lies 61 ft. lower at 3815 ft. At this depth three or four bands of banket have been cut, assaying 4.1 dwt. over a width of 69 in., including the quartzite partings. This value is rather low, but good results in the south reef were not to be expected in view of the poor disclosures in the Village Deep above. In this part of the Rand, at great depth, the lower reef—the Main Reef Leader—is the basis of all prosperity. As the south reef has been cut at 3815 ft., it may be safely estimated that the Main Reef Leader will be found about 100 ft. lower.

It is some weeks since the committee in charge of the stope-drill competition issued a report on the results of the underground trials. As the drills are being tried in four different mines, injustice might easily be done by attempting to anticipate the verdict of the judges. The elimination trials underground were conducted principally by men better acquainted with the mechanism of the drills than with the placing of holes on other aspects of mining work. Now that the machines are in the hands of capable miners, more promising results are being obtained. Trouble still appears to be experienced with the hollow steel used in conjunction with some of the drills and one of the machines, the Siskol (a reciprocating drill) has been obliged to use solid steel. The four drills now mentioned as doing especially good work are the Chersen, Holman 2⅛- and 2¾-in., and the Siskol. The Chersen and Holman drills have been used upon the Rand in ordinary practice for many months, but the Siskol, which led at the surface trials with the remarkable speed of 434 in. per min. was first introduced upon the Rand as a competitor in the trials.

As reported in previous communications, the Premier Diamond Mining Company has fearlessly increased its scale of operations in spite of the market's continued lack of activity. During the six months ended April 30, 1909, the company washed 3,612,254 loads of mine ground and 20,911 loads of cylinder lumps for a yield of 938,388 carats of diamonds. These figures show an increase of 271,700 loads of mine ground, of 77,000 loads of lumps and of 55,663 carats in output.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Alaska

KATALLA

Copper River Railway—It is stated that this company will work 2500 rockmen next winter to hasten the construction of the line to the Bonanza mines. There are 3000 men at work at present. A branch line will be built to the Behring lake coalfields as soon as it is known that the Government will give title to applicants for coal lands.

TANANA

The winter work as well as that under way at the present time will yield, it is estimated, considerably in excess of last season's production.

VALDEZ

The Government road between Valdez and Fairbanks will be completed by Sept. 1, according to Maj. W. P. Richardson, U. S. A. On the Yukon a winter road will be made from Eagle to Forty-Mile, and a wagon road from Circle City to the Birch Creek mines.

Arizona

COCHISE COUNTY

Denn-Arizona—A body of rich copper ore has been encountered on the 1200 level.

Gleason—The Southern Pacific branch line from Pearce to the old camp of Gleason was completed June 26. S. H. Bryant, a pioneer, drove a copper spike as being emblematic of the rich copper-turquois district opened by this road.

Copper Queen—Attorneys Neal and Sutter have filed suit in the district court against the Copper Queen Consolidated Mining Company for $1,250,000 in behalf of Thos. Winders, who acts as administrator of the estate of R. J. Winders, deceased, and various other heirs. The bill of particulars alleges that R. F. Winders was one-fourth owner of the Black Jack mining claim in the Warren district, and that the Copper Queen Company has received a net profit from the ores taken out of said claim to the value of $5,000,000 and the plaintiff asks damages in the sum of one-fourth that amount. During early years the property was transferred to various owners, finally again acquired by the Winders family, when a deed for same was issued to Mrs. Winders in 1892. Subsequently the property was deeded to the Copper Queen and, as now claimed, the deed was not signed by the husband.

GILA COUNTY

Superior & Boston—The last payment has been made on the Collins-Doyle property, although it was not due for nearly a year. This gives the company title to about 1000 acres of land. W. G. Rice, Globe, Ariz., is president.

Cactus—Three miles of wagon road are to be built from this to the Live Oak property. It is reported that a concentrator is to be built. The mine is 5 miles from Miami. C. W. Pritchett, of Denver, is general manager and consulting engineer. Mine office, Globe, Arizona.

Warrior—Daily ore shipments to Globe amount to 65 tons. The larger part of the ore is from development work.

PINAL COUNTY

Ray Consolidated—It is reported that a contract has been let by the company for about 4000 tons of structural steel to be delivered next autumn for the construction of reduction works.

YAVAPAI COUNTY

Consolidated Arizona—A number of men are now engaged in unwatering the Blue Bell mine preliminary to active development. It is reported that the smelter will resume custom business.

California

BUTTE COUNTY

Boston & Oroville—The old Continental dredge at Oroville is being dismantled after 10 years' work. The tract of land on which the dredging has been done is worked out.

Big Blue Lead—Superintendent N. Lambert, of Bangor, expects to resume operations on this gravel mine by the middle of July. The new ditch is almost completed.

Butte Creek Consolidated—Manager H. C. Chesboro reports that gold enough is being obtained to shortly pay off the indebtedness on the dredge on Butte Creek. This is a Los Angeles company.

CALAVERAS COUNTY

Plymouth Rock—San Francisco men have obtained a bond on the mine at Jenny Lind and are running five of the stamps on satisfactory ore.

Washington—Eastern men have purchased the Letora ranch near San Andreas for the purpose of developing this and other mines.

Fox—The new dredge at this property near San Andreas has started operations.

MARIPOSA COUNTY

South Fork Power and Mining Company—This Boston company locally represented by Smith and Arnold has acquired the Great Tree group of mines on the South Fork, five miles from Hites Cove.

MODOC COUNTY

Bidwell Consolidated—In the Mountain View mine, near Fort Bidwell, ore of high grade has been discovered on the 150-ft. level.

MONO COUNTY

Casa Diablo—Fourteen men are now taking out 30 tons of ore daily and another crew is doing development work. The mill is running steadily.

NEVADA COUNTY

Fairview—From this property, at Relief Hill, C. M. Wilson, manager, much specimen ore is being taken out. In addition to the rich seam close to the hanging-wall, the vein carries high average values.

Lecompton—This mine, at Nevada City, has been finally unwatered and the mill has been started up on ore.

Prescott Hill—The shaft of this mine, at Grass Valley, now 1300 ft. deep, is to be continued 500 ft. deeper.

Champion—In the Providence mine of this company, at Nevada City, leasers have discovered on the footwall on the 600 level, a 2½-ft. vein. The Providence is one of the oldest mines in the State.

PLUMAS COUNTY

Newton—This company, of which S. J. Norris is a large owner, is operating a steam scraper on one of its claims on Coquette creek. The gravel deposit is on a bar or flat, where there is little grade and the scraper hauls the gravel up the side of the hill to a point where it may be washed.

Pilot—Operations will shortly be resumed on the quartz mine in Onion valley.

SAN LUIS OBISPO COUNTY

Klan—The quicksilver mine has been started up again and the furnaces have been put in order. H. D. Richards, of Paso Robles, is manager.

SHASTA COUNTY

Mountain Copper—The Iron Mountain depot, the bunkers and the company's saw mill and timber shed at Iron mountain have been destroyed by fire. No ore can be shipped until the bunkers are rebuilt.

TUOLUMNE COUNTY

United Mines Corporation—The company is retimbering the old Dead Horse shaft. Drifting is being done from the raises and the mills are crushing 300 tons of ore per day.

Confidence—The bond having been forfeited, the owners, Baker and Hamilton, of San Francisco, will soon resume work on the mine.

Colorado

BOULDER COUNTY

Cashier—The mill at Camp Albion is being remodeled and extended to handle the lead ores of this property.

Yellow Pine—This old silver mine has been acquired by a new company and is to be extensively developed.

GILPIN COUNTY

Moon Gulch—The Siren property, recently acquired, will be developed by this company under the direction of L. C. Todd, Rollinsville, Colo.

Russell—Smelting ore has been encountered by leasers on the 300-ft. level. M. A. Harris, Russell Gulch, Colo., is superintendent.

Aztec—An electric pump is to be installed to unwater the lower levels for further development. J. E. Hastings, Central City, Colo., is manager.

Hearne—The main shaft will be sunk deeper as soon as the lower levels can be unwatered by the electric pump. W. H. Hearne, Central City, Colo., is in charge.

CLEAR CREEK COUNTY

Whiting—The development of the Terrible and Dunderberg mines near Silver Plume will be undertaken, following the visit of Eastern stockholders.

Nashotah—After an idleness of two years the property on Sherman mountain, near Georgetown, is to be reopened. Some equipment renewals will be required.

Horstman & Snowy Range—Operations have been resumed under the direction of W. H. Robinson, of Georgetown. A milling plant is contemplated.

SAN JUAN COUNTY

Ophir Consolidated—Upon foreclosure by the bondholders the property at Ophir was sold on June 21, 1909, to the Milwaukee Trust Company for $335,988.

LAKE COUNTY—LEADVILLE

Tribune—Through the Yak tunnel this Breece Hill property is being worked at a depth of 1340 ft. from the surface and the breast of the drift is now about 600 ft. from the tunnel. The drift has passed through 150 ft. of mineralized ground, the last 50 ft. being pay. Several carloads have been shipped.

Penn—The various lessees on this property are shipping steadily from both the lower and the upper levels, the daily output being in the neighborhood of 250 tons.

Sunday Tunnel—Development work is being carried on from the tunnel level south on the vein. Work is also being done at the 550-ft. level from a drift in the old shaft on the copper vein, which at this point is about 5 ft. wide.

Lilian—Lessees have resumed washing the dump and from 150 to 200 tons are being handled daily; the returns in gold are better than day's pay, and considerable lead is also saved. The lessees in the mine are shipping regularly gold ore of good grade.

Helena—It is reported that the stockholders in Pittsburg have subscribed the money to pay off all indebtedness and to continue the development of the favorable showing at the 780-ft. level.

Dinero Tunnel—Work has been temporarily suspended on this Sugar Loaf enterprise, but is to be resumed again in a week or two if the company succeeds in raising the necessary funds to carry out the more active campaign that has been planned.

Garbutt—As development is pushed on this claim the orebody increases and 50 tons daily are being sent to the local smelter. When the ground is thoroughly opened it is probable that the output will be doubled.

Cleveland—Driving for the footwall is still in progress; the vein is now over 20 ft. wide, with 5 ft. of smelting ore and the balance low grade.

TELLER COUNTY

Corialanus—Leasers operating on the north block have encountered a new ore shoot, from which a trial shipment has been made.

Portland Gold Mining—Work was commenced on June 28 on grading the roadbed to the site selected for the new 300-ton mill near Victor, Colo., to treat the extensive dump of this company. Excavation for the mill buildings is also in progress. The site selected is on the northeastern slope of Battle mountain between No. 2 and No. 3 shaft.

Gold Dollar Consolidated—Cleaver & Sharp, sub-lessees at the Husted shaft dump, have installed a washing equipment which is to have a daily capacity of 125 tons.

Illinois

The following apportionment of mine inspection districts in Illinois has been made, effective July 1. They show the counties, number of mines, men and tons produced:

First District—Inspector, Hector McAllister, Streator. Counties—Grundy, Kankakee, La Salle, Putnam and Will; 65 mines; 7524 men employed; 3,383,364 tons of output.

Second—Inspector, Thomas Hudson, Galva. Counties—Bureau, Fulton, Henry, Knox, Mercer, Rock Island, Warren; 216 mines; 9168 men employed; 4,515,424 tons of output.

Third—Inspector, John Dunlop, Peoria. Counties—Hancock, Livingston, Logan, McDonough, McLean, Marshall, Peoria, Schuyler, Stark, Tazewell, Woodford; mines, 179; men employed, 5151; 2,792,586 tons of output.

Fourth—Inspector, Thomas Weeks, Bloomington. Counties—Brown, Cass, Menard, Morgan, Sangamon, Scott; 68 mines; 7336 men employed; 5,502,104 tons of output.

Fifth—Inspector, Thomas Moses, Westville. Counties—Christian, Edgar, Macon, Moultrie, Shelby, Vermilion; 65 mines; 6556 men employed; 4,493,781 tons of output.

Sixth—Inspector, James Taylor, Peoria. Counties—Calhoun, Green, Jersey, Macoupin, Montgomery; 43 mines; 6753 men employed; 5,625,204 tons of output.

Seventh—Inspector, W. W. Williams, Litchfield. Counties—Bond, Clinton, Madison, Washington, Marion; 49 mines; 7077 men employed; 5,870,767 tons of output.

Eighth—Inspector, Walton Rutledge, Alton. Counties—Randolph, St. Clair; 92 mines; 6027 men employed; 5,190,966 tons of output.

Ninth—Inspector, W. S. Burris, DuQuoin. Counties—Franklin, Gallatin, Jefferson, Perry, Saline, Wabash, White; 73 mines; 7747 men employed; 5,891,130 tons of output.

Tenth—Inspector, Thomas Little, Murphysboro. Counties—Jackson, Johnson, Williamson; 72 mines; 7502 men employed; 6,007,126 tons of output.

Michigan

COPPER

Ahmeek—Work on the stamp mill that this company is erecting is going forward satisfactorily; the steel frame work is in position and the work of inclosing the building is nearing completion, and barring some unforseen delays this mill will be ready for service about Dec. 1. The mine is shipping about 1700 tons of rock daily, about equal amounts going to the Tamarack and Franklin mills.

Atlantic—Section 16 shaft is down about 2100 ft. and is bottomed in the same shattered formation that has characterized this opening from the start. The lateral openings are being extended in hopes of passing through this broken zone and a more substantial formation revealed. The company has a large tract of unopened ground and it may yet encounter paying rock. This shaft is at present the deepest opening on the Baltic lode.

Winona—Excavating on the site of the stamp mill that is to be erected jointly by this and the King Philip company has

been completed and work on the foundations is going forward rapidly. A dam of about 100,000,000 gal. capacity is to be built at the Sleeping river for its water supply. It is planned to re-use the water after it has passed through the mill. This is to be accomplished by a system of settling and clarifying and the water then pumped back to the heads. In this manner it is thought that it will only be necessary to draw on the fresh water supply for about one-third the amount.

LaSalle—The company has cleared the site for the proposed new shaft, the overburden at this point being only a few feet thick. This shaft is going down on the Kearsarge lode at a point between the No. 1 shaft of the Tecumseh tract and No. 1 of the Caldwell tract. No. 1 shaft of the Tecumseh is down to the 17th level, and from the 10th level a good grade of rock has been in evidence. Developments at the Caldwell tract has not yet revealed anything of a substantial nature. The equipment of No. 2 shaft of this tract will be moved to the new shaft and operation will start in the near future at this point.

Seneca—The shaft that is going down on this property has reached a depth of 440 ft. and a station is being cut preparatory to driving a crosscut to open the formation. This shaft is in the foot wall, about 60 ft. behind the lode. At a depth of 200 ft. the first level was established and the lode cut by means of a crosscut; it was found badly shattered and carried practically no copper.

Franklin—The No. 1 shaft is below the 26th level. At this level a crosscut is being driven to the Pewabic lode. As depth is obtained there seems to be a gradual increase in the mineral contents of the rock. The north drifts from the 21st, 23d and 24th levels are within the Rhode Island tract. All work on the conglomerate lode will be discontinued as soon as the ground that has been broken down is hoisted. Work will be transferred to the Amygdaloid lode.

Oakland County

Detroit Salt Company—Rock salt, said to be a good quality, was struck on June 26 at a depth of 900 ft. at the property in Oakwood, about 40 miles from Detroit. Prospecting was begun about a decade since, but was discontinued several times on account of shaft-sinking difficulties, the flow of silt and water being finally overcome by cementing the walls of the shaft under the direction of Engineer Bradt. It is proposed to mine the deposit and a surface plant is to be installed at once.

Missouri

Zinc-lead District

Webb City—Floods have occurred on Center creek and the Richvale, American Beauty, Vantage, Mercedes, and McConey mines are under water. It will take several weeks pumping to unwater these properties.

Peacock—The Moler-Smith mine has been flooded by Center creek and the steam shovel and all the large pumps are under water. The large gas engine which operated the pumps was removed before the flood came.

Hartford—The mine at Galena has entered the producing list again with an output of 125,000 lb. of zinc.

New Century—This company is overhauling its 300-ton mill, the largest in Galena, with a view to resuming operations at once.

Little Jen—This mine west of Joplin has encountered ore at 150 ft. that bids fair to keep the 150-ton mill running full time.

Little Persimmon—This company has been incorporated at Carthage with a capital stock of $50,000. H. T. During and others, of Carthage, are the incorporaters.

Sarcoxie—A deal has been consumated by which the Optimo, Lone Pilgrim and O. K. properties have been brought under one management. These mines are large producers of high-grade ore. F. A. McClelland, of Sarcoxie, is manager.

Red Dog—Electrical equipment to the amount of 200 h.p. has been installed.

Lehigh Circle—The John Nilson farm at Carl junction was purchased by this company for $26,000. An orebody has been encountered at a depth of 156 ft. Development work will continue. F. A. Brown, of Joplin, is president.

Granby—Prospecting is in progress on 1400 acres of land two miles west of Spring City.

Carnation—The 300-ton plant at Prosperity was started last week.

Montana

Butte District

Butte & Highlands Gold Mining Company—The company has recently been incorporated by C. V. Franzman, T. R. Cook, Isador Klein, Charles Barnaman and W. N. Waugh. The capital stock is $1,000,000 with shares of the par value of $1 each. The company owns six claims located about 10 miles from Feeley, on one of which a 75-ft. shaft has been sunk.

Coalition—Sinking has been started at the Rarus. The shaft is now down 2250 ft. and will be sunk another 100 ft. before a station is cut. About 850 tons of ore are being hoisted daily. At the Tramway mine sinking will be begun this month for the purpose of making room for the lowering of the big cages to the lowest level. It is probable that the sump will be increased 30 ft. On the 1700 ft. level a crosscut is being run to the Minnie Healey ground. The crosscut is in at present about 70 ft., and it is thought that the lead will not be reached in less than 250 ft. The Tramway is hoisting about 650 tons of ore daily, most of which comes from the Minnie Healey.

Beaverhead County

Silver Fissure—General Manager Harry Armstead, Jr., arrived from New York the first of the week to inspect the property at Polaris. He states that the company will build a spur from Polaris to connect with the new Gilmore & Pittsburg railroad.

Broadwater County

Ohio-Keating—The south shaft, now down 125 ft., is being cleaned out and retimbered preparatory to sinking another 100 ft. A No. 5 Knowles pump is being operated on the 120-ft. level.

Nevada

Elko County—Midas

Old Judge—This property adjoining the Elko Prince mine has been leased and bonded to B. P. Howell and associates. A tunnel 125 ft. long has already been driven.

Gold Crown—Two shifts are being worked in the lower tunnel which is drifting on the ore.

Esmeralda County—Luning

Lodi Mines Company—The company will soon blow in its new lead smelter. The furnace is to use a vaporizing system, by which the shortage of water is expected to be overcome.

Lincoln County—Pioche

Nevada-Utah—Since June 1 the Day mine has been running two trains daily on the narrow-gage road to Pioche, and handling from 150 to 230 tons of ore. The output of the mine is increasing.

Pioche Metals—The first carload of ore produced under the new management was shipped last week. Regular shipments will be made as soon as a new gasolene hoist is installed. The mine is four miles west of Pioche and owned by John A. Kirby and associates.

San Pedro, Los Angeles and Salt Lake Railroad—A preliminary survey has been completed from the Prince Consolidated mine to Pioche, via Pioche Metals mine, a distance of eight miles. Another route is being surveyed from the Prince direct to Panaca, making a shorter haul to Salt Lake, but not going near any of the other mines as does the first survey. Three to five cars of ore are being shipped daily from Pioche to Salt Lake smelters.

Nye County—Bullfrog

Denver, Clothier, Jingles—Returns from the last shipment of 21 tons, sent out from this lease, show a value slightly under $95 per ton.

Bullfrog Pioneer—Thirteen cars of ore

were sent out during the week ending June 19, averaging from $40 to $50 per ton.

NYE COUNTY—GRANTSVILLE

Alexander—This group of gold and silver claims has been transferred by the Horn Silver Mining Company, which has held them as collateral security for about 20 years, to the Cupric Mines Company, the latter company paying $400,000 of its stock and agreeing to provide the capital necessary to promptly develop the property. A report on the property is being prepared by Engineer J. B. Wilson. The Cupric Mines Company has offices in the Whitehall building, New York, and at 207 Templeton building, Salt Lake City. It also operates a group of 16 claims in the San Francisco district in Beaver county, Utah.

NYE COUNTY—MANHATTAN

Goldfield-Bald Mountain—The electrically operated machinery has been put into commission and the hoisting capacity is now 125 tons per day.

Edith—This claim, consisting of 1000 ft. in the main gulch has been purchased by G. W. Pierce and associates of Denver. A third shaft is being sunk to bed rock.

Big Five—Operating about a mile below Central, the company now has its machinery in place and has begun washing gravel.

San Francisco—This placer company is managed by Jeffrey Schweitzer. Electric hoist and pumps are to be installed.

NYE COUNTY—RHYOLITE

Keane Wonder—The new shaft has opened up a wide orebody which shows good milling ore throughout. The orebody is being explored by a crosscut.

NYE COUNTY—ROUND MOUNTAIN

Round Mountain—J. P. Loftus, president, has just completed an examination of the mine, and reports that it is in better condition than ever before. The clean-up for the first 15 days of June resulted in $22,000 bullion. In the 700-ft. level a remarkably fine ore shoot has been disclosed which shows a width of 7 ft. The mill at present is treating between 90 and 100 tons of ore per day.

NYE COUNTY—TONOPAH

MacNamara—The new 10-drill compressor, motor and transformers have been put into commission. Six carloads of ore averaging 50 tons each were shipped last week to the Balaklala smelter in Shasta county, Cal. Most of this ore came from the 200-ft. level.

Montana - Tonopah—Chas. E. Knox, president of the Montana-Tonopah Mining Company, inspected the property last week and as a result it is reported that work will be pushed in the north crosscut on the 765-ft. level. The semi-monthly clean up of cyanide precipitates resulted in the production of 25 bars of bullion of about 80 lb. each.

Tonopah Mining—The regular quarterly dividend of 25c. per share and an extra dividend of 10c. per share have been declared, payable in July. During the last week 144 ft. of new work was driven, the Mizpah shaft being sunk 14 feet.

West End Consolidated—Development amounting to 88 ft. was completed last week. Shipments to the smelter amounted to 85 tons.

Tonopah Extension—Underground development has been shut down and will probably not be resumed until the mill is completed, work on the foundation of which is now being rushed. Contracts were awarded last week for furnishing different portions of the machinery, and it is expected that the mill will be ready for operation by the end of the year.

Belmont—Development work is being actvely carried on on the 1100-ft. level and the ore reserves there are being constantly enlarged. The east drift from the bottom of the winze, sunk from the 1000-ft. levels shows four feet of high-grade milling ore in the face.

STOREY COUNTY—VIRGINIA CITY

Brunswick—A reorganization of the companies operating on the Brunswick lode has been effected. The officers of the new company are E. P. Barrett, president, A. K. Durbrow, secretary and James H. Kinkead, superintendent. It is proposed to confine exploratory work to the vicinity of shaft No. 1 which is 1200 ft. deep on the incline.

WHITE PINE COUNTY—ELY

Steptoe Valley Smelting and Mining—It is expected that the copper production for June will reach considerably over 5,000,000 lb. of copper, of which the Nevada Consolidated will contribute about three-fifths and the Cumberland-Ely the balance. Three units of the Steptoe concentrator have been in operation during June, each unit handling approximately 1500 tons per day. The fourth unit will be finished about July 20 and is expected to be in good running condition by the first of August. It is officially stated that ample water for any future extensions has been provided by the developments on Duck creek and at the hydroelectric plant on the McGill ranch. At the smelter three reverberatory furnaces and three converters have been operating during June, and the fourth reverberatory is to be completed about July 25. This furnace will probably be put in operation during the early part of August. The fifth reverberatory is now under way, construction work having been started on June 10. The concentrator at Steptoe is in charge of Superintendent Waddell, and S. S. Sorensen, formerly of the Utah Consolidated, is superintendent of the smelter. The entire operations of the three companies, the Nevada Consolidated, the Cumberland-Ely, and the Steptoe reduction works, are under the general direction of C. B. Lakenan.

Oklahoma

MURRAY COUNTY

Indian Mining and Development Company—A valuable zinc field is being opened up at Davis. This company has been hauling ore from the mine for a three-carload shipment. Messrs. McGuire and Robnett, who are operating leases adjoining those of the development company, are preparing to work their mines. Ore from the latter has been tested that runs from $10 to $20 per ton.

Pennsylvania

ANTHRACITE COAL

Delaware, Lackawanna & Western Coal Company—This company is organized to buy and sell the coal mined by the Delaware, Lackawanna & Western Railroad Company. The contract provides that the new company shall buy all the coal at the mines at a price to be 65 per cent. of the tidewater selling price. The coal company in addition to paying such price for the coal, assumes all transportation charges from the mines. It is capitalized at $6,800,000, and all of the stockholders of the railroad company will be invited to subscribe to the stock of the coal sales company on the basis of one share of stock of the coal sales company for each four shares of stock held by them, respectively, in the railroad company. It is expected that a large majority of the stockholders will so subscribe. The incorporators of the company elected as directors George F. Baker, Jr., Percy R. Pyne, 2d., James A. Stillman, Edward E. Loomis, William H. Truesdale, George E. Gardiner, and Henry R. Taylor. The board has elected as president of the Delaware, Lackawanna & Western Coal Company, Edward E. Loomis; vice-president, Daniel E. Russell; secretary and treasurer, J. J. A. Owens.

BITUMINOUS COAL

Maryland Coal Company—The first coal has been hoisted from the Coleman shaft at St. Michael, on which work has been in progress for about two years. The shaft is 670 ft. deep, tapping the B, or Miller vein. It is thoroughly equipped with pumping and hoisting machinery and tipple of the latest patterns.

Tennessee

POLK COUNTY

Tennessee Copper—Preparations are being made to enter the sulphuric acid field on a larger scale than originally planned and the directors have authorized

the construction of an additional unit that will more than double the present capacity.

Utah

BEAVER COUNTY

King David—The big double-compartment shaft at the King David is down 400 ft. and will be continued to the 500-ft. level, when drifting will be commenced and the work of opening up the mine will start in earnest. David Evans, manager, Salt Lake City.

North America—Although the shaft is going down at a distance of 100 ft. away from the contact, a fissure filled with lead carbonate ore carrying silver has been encountered at a depth of 165 ft. Charles Morrison, manager, Salt Lake City..

Leonora—At a distance of 318 ft. from the mouth of the tunnel a vein over 4 ft. wide has been cut, which contains good silver-lead ore, carrying some gold. John Matson, manager, Beaver, Utah.

Cupric Mines—At a depth of 296 ft., the workings have passed through 7 ft. of high-grade copper ore. Sinking is being continued to catch the Horn Silver ore channel.

JUAB COUNTY

Tintic District—During the week the ore shipments totaled 203 car loads as follows: Yankee, 2; Centenniel Eureka, 48; Uncle Sam, 4; Bullion Beck, 3; Eagle & Blue Bell, 1; Chief Consolidated, 1; May Day (crude), 9; May Day (concentrates), 1; Victor Consolidated, 1; Victoria, 2; Grand Central, 5; Mammoth, 1; Sioux Consolidated, 13; Colorado, 36; Lacleve, 1; Swansea, 6; Iron Blossom, 30; Beck Tunnel, 3; Dragon Iron, 35; Carisa, 1; Ajax, 3.

SALT LAKE COUNTY

Columbus Consolidated—The company is sending down 50 tons of crude ore per day over the aërial tramway from Alta to Tanner's Flat, whence it is hauled by team to Sandy.

Boston Consolidated—The twelfth unit of the concentrating mill at Garfield was put in commission on June 20. The thirteenth unit has also been completed. The net copper production for May was 1,515,480 lb., of which 1,273,928 lb. were obtained from porphyry ore, and 241,552 lb. from sulphide ore. This production was obtained from 67,956 dry tons of porphyry ore and 5224 tons of ore from the sulphide mine.

South Columbus—The body of shipping ore recently found about 60 ft. from the Quincy drift is holding up well. In a winze 100 ft. below the Quincy drift, the same vein has apparently been encountered. The company is drifting under the body of high-grade ore recently opened in the Wedge shaft.

Bingham Metal—The Bingham Central Mining Company, of which Samuel Newhouse is president, and the Bingham Standard Copper Company, both having mines in Bingham cañon, have filed amendments to their articles of incorporation, this action being taken to enable a merger of the two companies into the Bingham Metal Mining Company. The details of the consolidation are to be announced in July.

TOOELE COUNTY

Susanna—A mill is being erected to treat the gold ores developed in this property in the Park Valley district.

Canada

ALBERTA

West Canadian Collieries—A new tipple is to be constructed at this company's Bellevue mine, the engineer being on the ground laying out the work. Chas L. Rameau, of Blairmore, Alta., is general manager.

BRITISH COLUMBIA—ATLIN

North Columbia Gold Mining Company—The season has opened disastrously for this company, of Cincinnati, Ohio, operating the Pine Creek Power Company's hydraulic gold mining property on Pine creek under the management of J. M. Ruffner. The Pine Creek Power Company owns 4½ miles of placer leases on Pine creek, 575 acres of bench lands, and extensive water rights. The mine equipment included 12 monitors, 10 miles of ditch and flume carrying prior to enlargement 4500 miners' inches of water, three miles of pipe reducing from 30 to 13 in., and a dredge of the dipper type. During 1907 and 1908 the ditch was enlarged by the dredge for five miles to 26 ft. wide by a minimum depth of 6 ft., calculated to carry 15,000 miner's inches of water on a grade of 8 ft. to the mile. At Surprise lake a dam was constructed which raised the level of the lake 6 ft., thus providing a reservoir with an area of about 16 miles by 4500 ft. Floods resulting from heavy rains recently broke away this dam, and an immense volume of water carried everything before it as it swept down the creek. The damage is stated to be about $75,000, but it may be much larger. The loss of the water will involve a practical suspension of mining operations until fresh provision shall be made for a supply for gravel washing.

NOVA SCOTIA—SIDNEY

Dominion Coal—As a culmination of the controversy between the United Mine Workers of America and the Provincial Workingman's Association the former organization has declared a strike. Higher wages are demanded. Collieries Nos. 2, 6 and 9 are crippled by the walkout of about 6000 men and the strikers are making an effort to close colliery No. 2 which is the largest operated by the company.

ONTARIO—COBALT

Cobalt—The town of Cobalt was swept by fire on July 2. A considerable portion of the town was destroyed, and serious damage was done to the surface plants of a number of mines.

Ore Shipments—Shipments of ore from Cobalt for the week ended June 26 were: Buffalo, 46,153 lb.; Crown Reserve, 124,725; Drummond, 240,000; Kerr Lake, 61,600; La Rose, 139,367; McKinley-Darragh, 51,364; Nipissing, 453,135; O'Brien, 188,981; Right-of-Way, 61,363; Temiskaming & Hudson Bay, 63,000; total, 1,429,688 pounds.

Davis Silver Company—This company, owning 170 acres in southeastern Coleman, has adopted the leasing policy and has let three properties on five-year leases on a basis of 25 per cent. royalty on the output. Shafts are down on these leaseholds to 95, 85 and 65 ft., respectively, on calcite veins having low silver contents.

Nancy Helen—The directors have given a lease of a portion of the northern 40-acre lot to S. D. Madden. Diamond drilling on the main lot will be carried on in the hope of discovering rich ore.

ONTARIO—ELK LAKE

Cleaves Claim—This location, one of the earliest discoveries in the district, upon which a large number of calcite veins, six of them carrying silver, has been sold to the Beacon Consolidated Mines Company, of Boston.

Mexico

CHIHUAHUA

Batopilas—The company owns 1687 acres of mineral land which is to be thoroughly developed. In addition to this the directors have decided to do a large amount of prospecting on a concession which covers 62 square miles.

Hinds Consolidated—Deister sand tables have recently been installed in the concentrating mill.

Africa

RHODESIA

The gold production for May was 53,467 oz. fine; for the five months ended May 31 it was 248,768 oz. By values the total for the five months was $5,000,169 in 1908, and $5,095,653 in 1909; an increase of $95,484, or 1.9 per cent.

Other production reported in April includes 22,116 oz. silver, 11 tons copper, 81 tons lead, 33 tons asbestos and 623 tons chrome ore. The coal output was 14,420 tons.

Australia

QUEENSLAND

Gold output in April is reported at 34,689 oz. fine, a decrease of 5576 oz. from April of last year.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, July 7—The coal trade in the West continues to show a fair degree of improvement so far as steam coal is concerned. Manufacturers are taking larger quantities and the mines are doing more work in consequence. Prices have been held down at most of the large centers by the tendency of operators to ship too largely. This is the case on every apparent revival of demand, and it is very hard to keep down this tendency to over-production.

In the East the bituminous trade is also gaining ground, though not as fast as mine operators would like to see. However, there is a real improvement, with signs that it will continue, and many sellers of coal are preparing for active fall work.

The anthracite trade continues steady and rather quiet. Most of the collieries are running full time which, of course, only meant four days during the past week. The current week will not be much better, owing to the large number of men who are accustomed to take three or four days' holiday, at least, around the Fourth.

Announcement has been made of the plan finally adopted by the Delaware, Lackawanna & Western Company for meeting the requirements of the Hepburn law. In brief, it may be said that a new company is organized, the stock of which will be sold to stockholders of the railroad company. A long contract has been made under which this new company will buy all the coal mined by the railroad company and will take charge of its sale and its transportation to tidewater and to Western selling points. The company, therefore, will cease to carry any coal nominally belonging to itself. This is very much the same plan as that adopted by the Delaware & Hudson, in a general way, but differs somewhat in details.

Coal Traffic Notes

Tonnage originating on Pennsylvania railroad lines east of Pittsburg and Erie, year to June 26, short tons:

	1908.	1909.	Changes.
Anthracite	2,689,901	2,495,403	D. 194 498
Bituminous	15,690,393	17,040,186	I. 2,349,793
Coke	3,298,115	4,847,837	I. 1,549,722
Total	21,678,409	24,383,426	I. 2,705,017

Total increase this year to date 12.5 per cent. Increase for the week, 96,968 tons, or 11.3 per cent.

New York

Anthracite

July 7—The anthracite market is dull and monotonous. About the usual trade is being done and work at the collieries is generally good, although a majority of them announced a three days' holiday this week. Prices are unchanged, the regular schedule for the month on prepared sizes being $4.55 for lump, and $4.80 for egg, stove and chestnut, f.o.b. New York harbor. For steam sizes prices are also unchanged at $3.10@3.25 for pea; $2.35@2.50 for buckwheat; $1.70@2 for rice or No. 2 buckwheat; $1.25@1.50 for barley, all f.o.b. New York harbor. Some washery pea is still offered at 10 or 15c. below the list price.

Bituminous

Trade is improving a little, though there is no great boom nor any talk of one. The far East is buying some coal for immediate use and is talking about putting in stocks for winter, but has not quite come to the point so far. Long Island Sound is doing a little better in the buying way and there seems to be more activity among the New England mills. Now York harbor remains the weak point. All-rail trade is the strongest.

Prices in New York harbor remain unchanged at $2.40@2.50 f.o.b. for grades of steam coal, and $2.60 up for better grades. Gas coal is in fair demand with slack a little scarce.

In the Coastwise trade vessels are still in good supply, but there is a tendency to ask more money. Very few are getting it, however, and rates are practically unchanged from last week.

Birmingham

July 5—The coal market in Southern territory continues to improve and the output at the mines is growing better. Four or five new mines are being opened in Alabama, railroad extensions to be put in as the mines are opened. Old mines are beginning to resume operations. The statement is made on good authority that several large contract have recently been received by Alabama coal producers.

The coke demand is good. The work of rebuilding a battery or two of coke ovens in the Blue Creek region, in the southern part of Jefferson county, is being rushed to completion. The iron companies are having all demands for coke met right along. Coke quotations are healthy.

Chicago

July 6—The coal market is firm and quiet, with buying of harvesting coal increasing at a rate gratifying to dealers, and the steam trade somewhat better. With lump in better demand because of the harvesting requirements, fine coals continue the strongest in the market. Low prices due to forced sales to escape demurrage charges exist on some Illinois lump and indicate the general weakness of large-sized coal. The range of prices is low, because of the large amount of coal being supplied on contracts at minimum figures and the large shipments, relative to demand, that have been pouring in for many weeks. Speaking generally, however, there is an improvement in the market conditions, due to better arjustment between supply and demand and to slowly but constantly increasing consumption.

Illinois and Indiana coal brings $1.75@2.15 for lump, $1.60@1.75 for run-of-mine and $1.50@1.70 for screenings. Eastern coals, headed by smokeless, are in good demand, with prices held fairly firm by the lessened receipts on the best grades, but second-rate coal selling low. Pocahontas and New River smokeless sell for $3.05@3.30 for lump and egg, and $2.90@3.05 for run-of-mine. Hocking coal is still overabundant at $2.90@3.15, but improving. The anthracite market, like the bituminous domestic market, can hardly be said to exist in any satisfactory condition, but promises improvement with the general bettering of business conditions and the realization by retailers that early laying in of stocks is profitable.

Cleveland

July 6—The market has been dull, but perhaps not unusually so for a holiday week in midsummer. Lake shipments are slow, though there is plenty of coal on hand at all the Lake Erie ports. Local prices for steam coal are about the same; No. 8 district coal brings $1.90@$2.05, Cleveland, for lump; $1.70@$1.80 for run-of-mine; $1.40 for slack. Middle district coal is $1.85@$2 for lump; $1.65@$1.75 for run-of-mine and $1.25@$1.35 for slack. Pittsburg coal brings $2@$2.05, Cleveland, for run-of-mine.

Indianapolis

July 6—The midyear finds the coal-mining industry in an improved and favorable position. The mills, factories and railroad have entered upon the task of accumulat-

ing fuel supplies, and there are evidences of strength in other ways.

The domestic trade which usually brightens up in July is already manifesting interest in Indiana. Operators are giving attention to municipal contracts for the coming winter. Local dealers are also beginning to stock up under the belief that prices will soon advance. Manufacturers are likewise making inquiry about the lower grades, or steam coal, stating that it is their purpose to store their supplies for the next eight months.

Pittsburg

July 6—The regular movement of coal up the Lakes was scheduled to start today. The strike on the Lakes has not been definitely declared off, but there is enough labor available to man all the boats needed. Railroad shipments are not being greatly increased, as there was a large accumulation of coal at the docks. The market continues quiet and not particularly strong. Nominal prices continue at $1.10 to manufacturers and $1.20 to retail dealers for mine-run, these prices being shaded 5 to 10c. as formerly. Slack remains at 60@65c. per ton.

Connellsville Coke—The coke market continues dull. Nothing new has developed regarding the coke merger. The field work of the appraisements has been concluded and the office work is now in progress. A formal statement as to the nature and scope of the merger has been promised by the promoters the middle of this month.

Prices on furnace coke remain at $1.55 @1.60 for prompt and $1.65@1.75 on contract, depending on grade; standard foundry coke being $1.80@2 for prompt and $1.90@2.25 for contract.

The *Courier* reports the production in the Connellsville and lower Connellsville regions in the week ending June 26 at 320,634 tons, a gain of nearly 14,000 tons over the previous week. Shipments are reported at 4153 cars to Pittsburg, 6315 cars to points west of Pittsburg and 858 cars to points east of Connellsville, a total of 11,326 cars.

Foreign Coal Trade

German Coal Production—Coal production in Germany, four months ended April 30, metric tons:

	1908.	1909.	Changes.
Coal	49,293,530	48,181,594	D. 1,111,936
Brown coal	21,661,840	21,842,382	I. 180,542
Total mined	70,955,370	70,023,976	D. 931,394
Coke made	7,178,306	6,946,642	D. 232,664
Briquets made	5,854,721	5,929,165	I. 74,444

Of the briquets reported this year 4,698,707 tons were made from brown coal or lignite.

Spanish Fuel Imports—Imports of coal into Spain, three months ended March 31, were 534,561 tons, an increase of 78,615 tons over last year. Imports of coke, 63,713 tons, a decrease of 26,581 tons.

Welsh Coal Prices—Messrs. Hull, Blyth & Co., London and Cardiff, report current prices of coal as follows, on June 19: Best Welsh steam, $4.32; seconds, $4.08; thirds, $3.96; dry coals, $4.14; best Monmouthshire, $3.60; seconds, $3.48; best small steam, $2.70; second, $2.58. All per long ton, f.o.b. shipping port.

Iron Trade Review

New York, July 7—Although July is now well upon us, when dull business is usually expected, the iron and steel markets continue active, and business is still expanding. There is not, perhaps, quite as much new buying as there was a month or so ago, but inquiries are numerous and consumers show a disposition to fill their requirements for longer periods, indicating that they have confidence in the future.

In pig iron there have been good sales of foundry and basic iron in the East. The New England machinery makers seem to be waking up and are taking fair quantities of foundry. There has been a renewed demand among the pipe makers, principally for the lower grades of foundry pig. In the Central West there has been some buying of bessemer iron from the merchant furnaces, which has not been seen until very recently for over two years.

In finished material small structural contracts have made up a good aggregate of business. Such contracts continue to come in and some larger ones are under negotiation. There is also a good tonnage of plates and shapes for ship-building and car-building to be placed. Bars are in good demand and a general—but probably slight—advance in prices is expected.

The strike of the Amalgamated Association seems to be general so far as the American Sheet and Tin Plate Company is concerned. As announced last week the Association made terms with a number of independent companies and it is now negotiating with the Republic Iron and Steel Company with a strong probability that an agreement will be reached. This strike is referred to at length elsewhere.

Exports of Pipe—The sale is reported by the United States Steel Products Export Company of 9000 tons of pipe to the Anglo-Persian Oil Company for the development of the oilfields of Persia. The Mexican Petroleum Company is in the market for 6000 to 7000 tons of pipe, which will probably come to this country.

Baltimore

July 7—Exports for the week included 1,169,426 lb. tin scrap to Rotterdam and 2,404,000 lb. steel billets to Liverpool. Imports included 5003 tons cupreous pyrites from Spain and 5100 tons iron ore from Cuba.

Birmingham

July 5—The Southern pig-iron market is in a strong condition and gives signs of improvement. Quotations have advanced to $12.50 per ton, No. 2 foundry, with $13 asked for special brands and special analysis iron. A 50c. advance is again looked for in a few days, the demand being good. Four companies are remaining out of the market so far as immediate iron goes. Much of the iron that has been on furnace yards in this section of the country for several months now will begin to move out, the expectations being that 100,000 tons of the product will be carried off within 60 days if not quicker. The make in the Southern territory has not been increased, though four furnaces are on the calendar for operation soon. Inquiries are coming in from all parts of the country. One of the largest Southern consumers of pig iron was in the market inquiring for something like 25,000 tons recently. Several bids were made for the business but the prices were considerably over that which the buyer was willing to pay and there has been some delay in the trade. The manufacturers assert that there are no reasons why any concessions should be made.

Operations at the steel plant at Ensley continue briskly with additional labor being put on. The rolling mills of the Tennessee company at Bessemer, Ala., are working steel.

The cast-iron pipe plants in Southern territory have much business in hand or in sight. J. W. Worthington, of the Sheffield cast-iron pipe works, is quoted as saying that that plant would resume operations shortly.

Chicago

July 6—A better tone seems to exist in the iron trade generally, and pig iron is undoubtedly firmer, with Southern especially strong relatively to its position a week or two ago. Quotations hold firmly to $12 Birmingham ($16.35 Chicago) for No. 2 iron, with 25 or 50c. more asked for last quarter deliveries by some interests. Northern sales and demands are more steady, with $16.50 the ruling price and a slight premium on fourth-quarter business obtained in some sales. The average demand is yet small, but the volume of sales is large, and some melters have bought good-sized lots. Melters continue to make heavy inquiries that indicate a disposition to buy freely in the event of a decisive turn in the range of prices, but such a turn is not expected soon. All branches of the iron and steel trade are watching developments closely.

The general conditions of iron and steel products continue encouraging; there is heavy buying, widely distributed, and increasing activity of users of such products. Coke remains at $4.70, with a good demand and supplies well regulated.

Cleveland

July 7—Ore is moving freely, and it is safe to say that no more trouble will be experienced from the lake vesselmen's strike. Sales of iron ore continue at a fair rate, prices being $4.50 f.o.b. docks for Old Range bessemer and $4.25 for Mesabi; $3.70 for Old Range non-bessemer and $3.50 for Mesabi.

Pig Iron—The market has been quiet, but prices are firm. For Cleveland delivery quotations are $16@16.15 for bessemer; $15.50@15.75 for No. 2 foundry; $14.85@15 for gray forge.

Finished Material—Some heavy orders for structural steel are pending; also for plates and other shipbuilding material. Specifications on contracts continue to come in well.

Philadelphia

July 7—The past week has not been productive of large orders. There has been steady buying of small lots among small consumers. The most interesting feature of the week is the receipt of inquiries from a few large foundry concerns which ordinarily do not buy until the latter part of August. Their early interest is caused by the fact that one element of vexing competition seems to have been withdrawn for the present—that of cutting Southern furnaces. Southern quotations have advanced. Quite a number of northern furnaces will blow in this month—six or seven. Their product is already practically sold. With Southern iron from 50 to 75c. higher it is possible for northern makers to do some business at better prices. The pipe founders continue to pick up orders. No. 2 X foundry is $16.50; Gray forge, $15.50; Basic, nominally the same.

Steel Billets—Notwithstanding the fact that two non-business days have intervened there has been a large amount of business done in billets. Prices have been marked up 50 cents.

Bars—The mills start out this week with order books well filled for several weeks. Prices are firmer than they have been. Orders from country iron stores are numerous.

Sheets—Corrugated sheet continues to sell freely and heavy plain sheet is under better sale. Users of sheet-mill products are now contracting with some liberality for future needs.

Pipes and Tubes—This branch of the industry is improving steadily.

Plates—All Pennsylvania plate mills are booking orders for all classes of plate users. Car building is making a heavy draw on the plate mills.

Structural Material—The rush of orders have only temporarily subsided. Western railway systems have about completed estimates which will be submitted within two weeks. Bridge builders are figuring on large orders. Municipal and county demands are coming along. Their orders are individually small, but there is a big bunch of them.

Scrap—The scrap demand is practically dead this week and scarcely any sales are reported.

Pittsburg

July 6—July and August are almost invariably quiet months in the iron and steel trade, and this year promises to furnish no exception as regards the placing of new business. There is, however, a large volume of specifications for finished steel products on the books, due in part to the fact that much of the low-priced material was sold with the definite proviso that a large tonnage should be specified by July 1. This will give the mills ample opportunity to run, and there will be no decrease in production except as mills here and there close for needed repairs, while a few mills are closed on account of failure to sign the Amalgamated Association scale.

The independent sheet and tinplate manufacturers which had formerly operated as union signed the Amalgamated Association scale at noon June 30. The American Sheet and Tin Plate Company stood on its declaration of a month earlier that it would operate on the open shop basis after the expiration of the scale June 30, and at the close of the night turn June 30 the men walked out of all the company's sheet and tinplate mills which had formerly been union, with the exception that the men at the Guernsey plant, Cambridge, O., continued at work. This closed 131 of the 202 tin-mills the company had been operating, leaving 71 non-union tin-mills running, which number is being increased to 90 by the starting of the United States and Monongahela works, which had been idle for a long time, but which had formerly been non-union. It is possible that no active efforts will be made by the company to break the tie-up. The sheet industry presents no problem, as only a portion of the company's sheet mills had been union.

The independent iron mills had also signed the Amalgamated Association scale, while the Republic Iron and Steel Company had failed to sign, the difficulty appearing to be only as to whether or not the continuous steel mills at the Brown-Bonnell and Sylvan works should be included in the agreement. On June 30 the men walked out of the company's iron mills, but it is understood the continuous steel mills at the Brown-Bonnell plant remained in operation, so that the question may solve itself in the near future, the company signing the scale for the iron mills and the Amalgamated Association relinquishing its claim to the continuous steel mills.

Pig Iron—Owing to the season of the year and the interruption of the holiday the pig-iron market has been quiet, but no strength has been lost and former prices are rigidly adhered to, at $15.50, Valley, for standard bessemer, $15@$15.25 for basic, $15@$15.50 for No. 2 foundry, $15.25@$15.50 for malleable and $14@$14.25 for forge, all f.o.b. Valley furnace, the freight to Pittsburg being 90 cents.

Steel—Prices in the open market remain firm, bessemer billets being $23 and bessemer sheet-bars $25, while open-hearth material generally is quoted at 50c. or $1 advance. The Carnegie Steel Company has advanced its price on forging billets to $27, Pittsburg. These usually command an extra of $2 over rolling billets. Deliveries of billets and sheet-bars on regular contracts will be smaller in July than in June, owing to a number of finishing mills closing for repairs, and, in the case of certain Steel Corporation sheet and tin mills, on account of the labor difficulty. Plates are stronger, concessions of $1 a ton from the 1.30c. price having entirely disappeared, leaving the market quotable at a minimum of 1.30@1.35 cents.

Sheets—The strike closes only a small proportion of the mills previously operated and as the independents are running fairly well the supply of sheets is ample. The market is fairly firm at 2.20c. for black and 3.20c. to 3.25c. for galvanized.

Ferromanganese—A sale of a round lot for delivery into next year and several sales of small lots are reported. The market is firmer, being quotable at $41, Baltimore, for delivery in the next 60 days; at $42 for delivery over second half, and at slightly higher prices for delivery into next year, freight to Pittsburg being $1.95 per ton.

Foreign Iron

German Pig Iron Production—The German Iron and Steel Union reports the production of pig iron in Germany in May at 1,090,467 metric tons, an increase of 43,270 tons over April. For the five months ended May 31 the make was, in metric tons:

	1908.	1909.	Changes.	
Foundry iron	955,328	944,200	D.	11,125
Forge iron	292,706	290,382	D.	2,324
Steel pig	426,329	447,585	I.	21,256
Bessemer pig	181,746	172,425	D.	9,321
Thomas(basic)pig	3,237,187	3,327,476	I.	90,289
Total	5,093,296	5,182,068	I.	88,772

The total increase was 1.7 per cent. Steel pig includes spiegeleisen, ferromanganese and all similar alloys.

Russian Exports—Exports of iron and steel from Russia for the full year were, in metric tons:

	1907.	1908.	Decrease.	
Pig iron	72,384	9,344	D.	63,040
Scrap iron and steel	30,944	2,992	D.	27,952
Rails	88,960	87,776	D.	1,184
Other iron and steel	27,048	8,169	D.	18,879

This shows a material decrease in all items except steel rails.

Metal Markets

New York, July 7—The markets have been rather quiet, on account of the holiday break. The tendency seems to be towards unchanged or lower prices.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
May 1909..	$11,171,265	$ 2,263,721	Exp. $ 8,907,544
" 1908..	26,555,913	3,101,002	Exp. 23,454,911
Year 1909..	55,487,891	17,767,857	Exp. 37,720,034
" 1908..	44,891,257	22,958,223	Exp. 21,933,034
Silver:			
May 1909..	4,428,448	3,857,388	Exp. 571,060
" 1908..	4,028,334	3,389,568	" 638,766
Year 1909..	23,854,629	18,532,453	" 5,322,176
" 1908..	21,077,185	17,688,150	" 3,389,035

Exports from the port of New York, week ended July 3: Gold, $2,992,000, chiefly to Holland and France; silver, $854,370, to London and Paris. Imports: Gold, $118,723, chiefly from Haiti and South America; silver, $79,957, from Mexico and Central America.

Treasury Department's estimate of amount and kinds of money in the United States on July 1:

	In Treasury.	In Circul'n.
Gold coin (inc. bullion in Treasury)	$ 188,411,745	$ 601,433,854
Gold certificates	34,772,660	817,829,209
Silver dollars	7,640,133	71,990,679
Silver certificates	6,096,484	478,317,516
Subsidiary silver	27,210,207	132,135,741
Treasury notes of 1890	10,013	4,204,987
U. S. notes	6,039,413	340,641,603
Nat. bank notes	23,415,062	666,505,012
Total	$293,595,717	$3,113,058,601

Amount of money in Treasury does not include government deposits in National banks, amounting to $63,230,880. Population of the United States July 1, 1909, estimated at 88,926,000; circulation per capita, $35.01. Total circulation shows an increase of $67,601,312 over July 1 last year.

Gold—No special demand developed for gold this week and the price in the open market in London continued at the minimum, 77s. 9d. per oz. for bars. Most of the gold arriving was taken by the Bank of England. In New York $2,500,000 was taken early in the week for shipment to Argentina on London account. There were arrangements made for further shipment of bars to Paris later, probably about $2,000,000, perhaps more.

Platinum—Business this week has been very dull owing to the broken week. Quoted prices are unchanged at $22.50 for platinum, $25 for hard metal containing iridium and $18@20 for good scrap.

SILVER AND STERLING EXCHANGE

July.	1	2	3	5	6	7
New York....	51⅛	51⅛	51¼	....	51⅛	51⅛
London.....	23⅞	23⅞	23 1/16	23 1/16	23⅞	23¾
Sterling Ex..	4.8810	4.8810	4.8810	.....	4.8805	4.8790

New York quotations, cents per ounce troy, fine silver; London, pence per ounce sterling silver, 0.925 fine.

Silver—The silver market has declined this week on speculative selling in India and also on sales by Chinese banks, and closes steady in London at 23½d., with the tendency uncertain.

Exports of silver from London to the East, Jan. 1 to June 17, as reported by Messrs. Pixley & Abell:

	1908.	1909.	Changes.
India.....	£ 3,929,158	£2,870,900	D. £1,058,258
China.....	516,400	1,155,100	I. 638,700
Straits.....	90,510	82,800	D. 7,710
Total..	£ 4,536,068	£4,108,800	D. £ 427,268

Imports for the week were £3000 from Mexico, £12,000 from New Zealand and £260,000 from New York; total, £275,000. Exports, £3500 to Port Said, £80,000 to China and £271,500 to India; £355,000 in all.

Copper, Tin, Lead and Zinc

July.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. New York, Cts. per lb.	Lead. St. Louis, Cts. per lb.	Zinc. St. Louis, Cts. per lb.
1	13¾ @13⅞	12⅞ @13⅛	58¾	29¼	4.35	4.25 @4.30	5.25 @5.30
2	13¾ @13⅞	12⅞ @13⅛	58⅞	28⅞	4.35	4.25 @4.30	5.25 @5.30
3	13¾ @13⅞	12⅞ @13⅛	....	28⅞	4.35	4.25 @4.30	5.25 @5.30
5	.....	.....	....	....	....	.....	.....
6	13¾ @13⅞	12⅞ @13⅛	58⅝	29	4.35	4.25 @4.27½	5.22½ @5.27½
7	13¾ @13½	12⅞ @13	58	29	4.35	4.25 @4.27½	5.22½ @5.27½

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis, New York, cash. The price of cathodes is usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—A midsummer dullness pervades the market and business during the week has been practically at a standstill. Ample quantities of copper are for sale at current prices, and in the absence of any demand the tone of the market is easy, the close being lower at 13¼@13½ for Lake; 12⅞@13c. for electrolytic in cakes, wirebars or ingots and 12¾@13c. for casting copper.

Copper sheets are 17@18c. base for large lots. Full extras are charged, and higher prices for small quantities. Copper wire is 15c. base, carload lots at mill. Business is rather dull.

Disappointed speculators have been steady sellers in the London market, and prices have crumbled away from day to day, the close being cabled at £58 for spot and £59 2s. 6d. for three months.

Refined and manufactured sorts we quote: English tough, £61 10s.; best selected, £60 10s.@£61 10s.; strong sheets, £72 10s.@£74 10s.

Statistics for the second half of June are cabled us as showing an increase of 5125 tons.

Exports of copper from New York and Philadelphia for the week were 6823 long tons. Our special correspondent gives the exports from Baltimore at 931 tons copper.

Tin—There has been a fair influx of orders in the London market from American sources, which helped to sustain prices early in the week. Toward the close there are rumors to the effect that the chief consumer in this country is trying to find a market for his surplus. These reports, however, are not taken seriously and prices have given way only slightly.

Spot business in New York is done around 29c., while the close is cabled from London as £135 15s. for spot and £132 12s. 6d. for three months.

Lead—Inquiries from consumers have been very light, and consequently the premium which has ruled for certain Missouri brands is gradually disappearing. The close is easy at 4.25@4.27½c., St. Louis, and 4.35c., New York.

The London market has again recorded a decline, the close being cabled at £12 15s. for Spanish lead and £12 17s. 6d. for English.

Spelter—In sympathy with other metals, the market for spelter has also given way somewhat; consumers having supplied their requirements for the time being. The close is barely steady at 5.37½@5.42½c., New York, and 5.22½@5.27½c., St. Louis.

The quotation for spelter in New York July 1-3, inclusive, was 5.40@5.45c.; July 6 and 7 it was 5.37½@5.42½ cents.

Base price of sheet zinc is 7c. per lb., f.o.b. La Salle-Peru, less 8 per cent. discount.

The London market closes steady at £21 17s. 6d. for good ordinaries and £22 2s. 6d. for special brands.

Silesian Spelter Market—Paul Speier writes from Breslau, Germany, under date of June 25, that prices have remained firm. Spelter is quoted at 45 marks per 100 kg.—equal to 4.85c. per lb.—f.o.b. works in Silesia. Zinc sheets are in fair demand at 52@56 marks per 100 kg.—average 5.83c. per lb.—base price. The tons of the market is strong. The production of spelter in upper Silesia for the first quarter of 1909 was 35,647 metric tons, an increase of 1337 tons over the first quarter of 1908. The output of zinc sheets for the quarter was 11,023 tons, a decrease of 2613 tons from last year.

Other Metals

Antimony—Current quotations are quite nominal at 8⅛c. per lb. for Cookson's;

7⅝c. for Hallett's; 7⅞c. for U. S., and 7⅜c. for outside brands. Business has been dull, owing to the tariff uncertainty.

Aluminum—Prices are unchanged at 22 @24c. base for No. 1 ingots; 31@32c. base for wire, and 33@34c. base for sheets.

Quicksilver—The New York price is a little lower, dealers quoting $43.50@44 per flask of 75 lb. Business is fair. San Francisco quotations are $43.50 for domestic and $41.50 for export orders. The London quotation is still nominally £8 7s. 6d. per flask, but jobbers sell at £8 1s. 3d., an unusual difference.

Nickel—Large lots, contract business, 40@45c. per lb. Retail, spot, from 50c. for 2000-lb. lots, up to 55c. for 500-lb. lots. The price for electrolytic is 5c. higher.

Cadmium—Current quotations 75c. per lb., in 100-lb. lots, at Cleveland, Ohio. In Germany, 450@475 marks per 100 kg. at factory.

Magnesium—Quotations for this metal are $1.25 per lb., New York, in 100-lb. lots; for 5-lb. lots, $1.40 per pound.

Spanish Metal Exports

Exports of metals and minerals from Spain, three months ended March 31, reported by *Revista Minera*, in metric tons:

Metals.	1908.	1909.	Changes.	
Pig and manuf. iron	5,470	5,568	I.	98
Copper	2,416	3,763	I.	1,347
Copper precipitate	5,388	3,923	D.	1,465
Lead	42,383	34,847	D.	7,536
Zinc	402	778	I.	376
Quicksilver	635	422	D.	213
Minerals.				
Iron ore	2,137,663	1,740,868	D.	396,795
Manganese ore	8,574	1,650	D.	6,924
Copper ore	316,420	273,041	D.	43,379
Lead ore	919	805	D.	114
Zinc ore	22,415	30,348	I.	7,933
Pyrites	365,081	275,058	D.	90,023
Salt	147,612	123,458	D.	24,154

Imports of phosphate rock, 25,395 tons in 1908, and 25,128 in 1909; decrease, 267 tons.

Zinc and Lead Ore Markets

Platteville, Wis., July 3—The base price of 60-per cent. zinc ore was $44@44.50; no premium price is reported. For 80 per cent. lead ore $57@58 per ton was paid.

SHIPMENTS, WEEK ENDED JULY 3.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Platteville	679,620	.....	.....
Benton	441,180	.....	.....
Hazel Green	237,300	45,700	.....
Strawbridge	198,000	.....	.....
Harker	185,960	.....	.....
Days Siding	176,000	.....	.....
Galena	154,000	.....	.....
Livingston	140,000	.....	.....
Highland	74,000	.....	.....
Cuba City	69,000	246,355	83,515
Linden	63,000	.....	.....
Total	2,418,060	292,055	83,515
Year to July 3	60,191,985	2,787,145	4,936,815

In addition to the above there was shipped to the American Zinc Ore Separating Company 291,600 lb., and to the Joplin Separator Works, 374,500 lb. zinc concentrates.

Joplin, Mo., July 3—The highest price paid for sulphide zinc ore was $47.50 per ton. The assay base price was $44@45 per ton of 60 per cent. zinc, but very little ore sold under the $45 base. Silicate zinc ore sold on a base of $17@19 per ton of 40 per cent. zinc. The average price, all grades, was $41.78 per ton. The highest price paid for lead ore was $57, offerings at the week-end declining to $55. The average, all grades, was $56 per ton.

Heavy buying was continued this week, and the purchasable stock is practically all sold. Purchases for the coming week must be curtailed to the output, which was greatly reduced by a water spout. The mines between Webb City and Oronogo and at Carl Junction were inundated. The inflow of Center creek and a small tributary between Webb City and Carterville created a heavy water problem for some of the sheet-ground mines. Though the market was strong until the purchasable ore was sold, it weakened materially at the week-end, indicating very light buying ahead.

SHIPMENTS, WEEK ENDED JULY 3.

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	4,098,210	595,420	$104,782
Joplin	2,221,390	325,740	57,961
Duenweg	811,950	127,130	21,015
Oronogo	661,160	.....	14,986
Alba-Neck	620,650	.....	13,964
Galena	546,390	53,390	13,241
Prosperity	477,920	54,380	11,797
Miami	532,350	48,030	10,660
Granby	713,220	23,350	10,356
Carthage	388,810	.....	8,753
Badger-Peacock	347,000	.....	7,634
Spurgeon	202,630	102,800	7,234
Aurora	370,410	.....	5,288
Quapaw	203,400	.....	4,175
Sarcoxie	88,700	.....	1,951
Carl Junction	50,630	.....	1,164
Zincite	52,730	.....	1,160
Totals	12,387,550	1,330,240	$296,121
27 weeks	306,018,970	48,039,880	$6,964,747

Zinc value, the week, $258,867; 27 weeks, $5,672,510
Lead value, the week, 37,254; 27 weeks, 1,292,237

MONTHLY AVERAGE PRICES

Month.	Zinc Ore. Base Price.		Zinc Ore. All Ores.		Lead Ore. All Ores.	
	1908.	1909.	1908.	1909.	1908.	1909.
January	$37.60	$41.25	$35.56	$38.46	$46.88	$52.17
February	36.63	36.94	34.92	34.37	49.72	50.50
March	36.19	37.40	34.19	34.71	49.90	50.82
April	35.40	38.63	34.08	37.01	52.47	55.63
May	34.19	40.06	33.39	37.42	56.05	56.59
June	33.06	44.15	32.07	40.35	60.48	57.52
July	34.55	.....	31.67	.....	59.90	.....
August	36.53	.....	33.42	.....	60.34	.....
September	37.63	.....	34.44	.....	54.59	.....
October	35.95	.....	33.28	.....	52.63	.....
November	39.13	.....	35.02	.....	54.53	.....
December	42.75	.....	39.63	.....	49.68	.....
Year	$36.63	.....	$34.31	.....	$53.93	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Chemicals

New York, July 7—Business for the week has been dull, as was to be expected from the combined effects of the holiday and the hot weather.

Copper Sulphate—The market remains stationary with prices unchanged at $4.22½ per 100 lb. for carload lots; $4.32½@4.40 per 100 lb. for smaller parcels.

Arsenic—The market is weak and quotations have fallen off slightly, 2¾@3c. per lb. being named for white arsenic. Two causes are named for the depression, the appearance of a new producer in the field, and the general belief that white arsenic will be admitted free of duty under the new tariff.

Nitrate of Soda—There is no change, but the demand is good and the article is firmly held. Quotations continue 2.15c. per lb. for spot, and 2.12½c. for futures.

Messrs. Mortimer & Wisner, New York, report the position of nitrate in the United States on July 1 as follows, in long tons:

	1908.	1909.	Changes.	
Stocks, Jan. 1	5,900	9,140	I.	3,240
Imports 6 months	124,950	150,350	I.	25,400
Total Supplies	130,850	159,490	I.	28,640
Deliveries 6 months	120,170	158,590	I.	38,420
Stocks, July 1	10,680	900	D.	9,780
Afloat for U. S.	60,000	71,000	I.	11,000

Quantities afloat include all cargoes due to arrive at United States ports before Oct. 15 next.

Mining Stocks

New York, July 7—The holiday this week added to the irregularity in the general stock market, already rather confused in its tendencies, as has been the case for the past week or two. Price movements were variable, some stocks advancing and others declining. While the market is still chiefly a professional one, there seems to be no directing power just at present, and profits are taken on very small fluctuations.

On the announcement of a plan for disposing of its coal, together with a dividend of 50 per cent. in cash, and 15 per cent. in stock, Delaware, Lackawanna & Western reached a record point, selling at $680 per share of $50 par value.

On the Curb the same conditions prevailed as on the Exchange. Price movements were irregular and some shares were notably heavy. This was the case with nearly all the copper stocks, which were depressed to a considerable degree. On the opening, after the holiday, trading was very dull and limited to small sales, but prices were rather firmly held. Cobalt shares were the active end of the market, and the industry that has been applied to bringing those issues into notice is evidently beginning to bear fruit. The Nevada gold stocks were rather neglected.

Boston, July 6—The triple holiday period tended to restrict market operations and the result has been a resting spell in the mining-share list. Prices have main-

tained a fair amount of strength and very few stocks are offering. Any attempt to buy them would easily put prices up.

American Zinc, which had a sharp upward movement last week, has been quick and the price ran off $1.50 to $29.25, with some recovery today. Superior & Pittsburg has had a good upward movement, extending $4 within the week to $18.50. This company is paying off its floating debt, incurred almost two years ago, at the rate, it is said, of $50,000 per month. The company is largely owned by Pittsburg interests.

Upon the announcement of the unexpected and sudden serious sickness of R. D. Evans, U. S. Smelting securities softened in today's operations. The common lost to $48.75 and the preferred went to the same figure. Mr. Evans sold his large interests in this company to other inside interests last spring because of internal dissensions, so that in the event of his death there will be no material effect on the company's future.

North Butte has been quiet and steady until today when it broke to $54.75, which is almost a $3 decline from a week ago. Although sentiment is not optimistic on this stock it is not particularly pessimistic.

Curb business has been on the wane, also. Prices, as a rule, have held well; while in the case of Ohio Copper the stock has risen over $1.25 to $5.50. Nevada-Utah has steadied on official reports that the company had no intention of calling an assessment and had a plentiful supply of ready cash with no debts.

STOCK QUOTATIONS

NEW YORK	July 7
Name of Comp.	Clg.
Alaska Mine	.12
Amalgamated	82¾
Anaconda	48½
Balaklala	†2½
British Col. Cop.	7⅛
Buffalo Mines	3½
Butte Coalition	25⅛
Colonial Silver	.30
Cum. Ely Mining	8
Davis-Daly	5¼
Dominion Cop.	7
Douglas Copper	2¼
El Rayo	2
Florence	3
Foster Cobalt	.32
Furnace Creek	.06
Giroux	7⅛
Gold Hill	½
Goldfield Con	6⅞
Granby	101
Greene Gold	⅛
Greene G. & S.	9
Guanajuato	1⅛
Guggen. Exp.	196
Hanapah	‡15
Kerr Lake	7¾
McKinley Dar.	.85
Miami Copper	15¾
Micmac	¾
Mines Co. of Am.	⅜
Montezu. of C. R.	33
Mont. Sho. C.	1 1/16
Nev. Utah M. & S.	2
Newhouse M. & S.	‡1¾
Nipissing Mines	10
Old Hundred	½
Silver Queen	.35
Stewart	1/16
Tennessee Cop'r	‡38¾
Tri-Bullion	⅜
United Copper	10¾
Utah Apex	6⅛
Utah Copper	49⅛
Yukon Gold	4 1/16

†Ex. Rights.

BOSTON	July 7
Name of Comp.	Clg.
Adventure	6¾
Allouez	‡42
Am. Zinc	29½
Arcadian	‡4
Arizona Com.	‡39½
Atlantic	9
Boston Con.	14⅞
Calumet & Ariz.	105
Calumet & Hecla	640
Centennial	‡32
Copper Range	81
Daly-West	‡7¾
East Butte	12¾
Franklin	17½
Greene—Can.	10
Hancock	10¼
Isle Royal	25⅛
Keweenaw	3½
La Salle	12½
Mass	8¾
Michigan	‡10
Mohawk	66
Nevada	23⅝
North Butte	55⅛
Ojibway	11
Old Colony	‡.60
Old Dominion	54
Osceola	‡132½
Parrot	31
Quincy	90
Rhode Island	‡4¾
Shannon	15¼
Superior	41¾
Superior & Bost.	15¾
Superior & Pitts.	17⅞
Tamarack	‡70
Trinity	12
U. S. Smg. & Ref.	49¾
U.S. Sm. & Re., pd.	49¾
Utah Con.	42½
Victoria	‡4¼
Winona	5
Wolverine	‡149
Wyandotte	‡2¾

‡Last quotation.

N. Y. INDUSTRIAL	
Am. Agri. Chem.	46⅛
Am. Smelt. & Ref.	94⅛
Am.Sm. & Ref., pf.	112¼
Colo. Fuel & Iron	44
Federal M. & S., pf.	‡88¾
National Lead	86⅛
National Lead, pf.	‡107
Pittsburg Coal	11⅛
Republic I. & S.	31
Republic I. & S., pf.	104¾
Sloss-Sheffield	‡82½
Standard Oil	‡685
U. S. Steel	68¾
U. S. Steel, pf.	125½
Va. Car. Chem.	54½

BOSTON CURB	Low.
Ahmeek	175
Chemung	14
Chino	8
Corbin	7
Globe Con	4¼
Helvetia	5¼
Ray Central	2 3/16
Ray Con	16⅞
San Antonio	10

Furnished by Hornblower & Weeks, N. Y.

ST. LOUIS	July 3	
N. of Com.	High.	Low.
Adams	.40	.30
Am. Nettie	.08	.06
Center Cr'k	1 80	1.50
Cent. C. & C.	82 00	81.00
C.C. & C. pf.	81.00	80 00
Cent. Oil	110 00	100 00
Columbia	8 00	7 00
Con. Coal	19 00	18 00
Doe Run	110.00	100 00
Gra. Bimet.	.30	25
St. Joe	13.00	12.00

LONDON	July 7
Name of Com.	Clg.
Dolores	£1 5s 0d
Stratton'sInd.	0 3 1½
Camp Bird	1 7 6
Esperanza	2 16 3
Tomboy	1 2 6
El Oro	1 7 0
Oroville	0 13 6

Cabled through Wm. P. Bonbright & Co., N. Y.

Furnished by Weir Bros. & Co., New York.

NEVADA STOCKS. June 30.

Name of Comp.	Clg.	Name of Comp.	Clg.
COMSTOCK STOCKS		Silver Pick	.10
Belcher	.48	St. Ives	.10
Best & Belcher	.40	Triangle	.01
Caledonia	.22	BULLFROG STOCKS	
Challar	.18	Gibraltar	.02
Comstock	.30	Homestake King.	.01
Con. Cal. & Va.	.88	Mont. Shoshone C.	1.50
Crown Point	.47	Tramp Cons	.05
Exchequer	27	MISCELLANEOUS	
Gould & Curry	.20	Cumberland Ely	7.87½
Hale & Norcross	.26	Giroux	7.62½
Mexican	1 02	Greenwa'r Copper	05
Ophir	1.47	Nevada Con.	23.12½
Overman	.32	Nevada Hills	87½
Potosi	27	Nevada Smelting.	1 00
Savage	.24	Nevada Wonder	.40
Sierra Nevada	.30	Nevada-Utah	1 87½
Union	.48	Penn-Wyoming	...
Utah	.05	Pittsburgh S. Pk.	47
Yellow Jacket	.51	Ray Central	2 43¾
TONOPAH STOCKS		Ray Con	16.75
Belmont	.85	Round Mt. Sphinx	10
Extension	.48		
Golden Anchor	‡ 51		
Jim Butler	.09		
MacNamara	.24		
Midway	.20		
Montana	.60		
North Star	.02		
Tono'h Mine of N.	6.62½		
West End Con	.20		
GOLDFI'D STOCKS			
Adams	.01		
Atlanta	.10		
Blue Bell	.02½		
Booth	.11		
C.O.D. Con	.11		
Columbia Mt.	.10		
Comb. Frac.	.60		
Con. Red Top	‡ 57		
Cracker Jack	.02		
Dia'dfield B. B. C.	.03		
Goldfield Belmont	.04		
Goldfield Daisy	.26		
Great Bend	.05		
Jumbo Extension	.10		
Kendall	.02		
Lone Star	.03		
May Queen	.03		
Oro	.06		
Red Hill	.05		
Sandstorm	08		

COLO. SPRINGS	July 2
Name of Comp.	Clg.
Acacia	.07
C. C. Con	‡ 03⅛
Dante	‡.05½
Doctor	.09¼
Elkton	.65
El Paso	.53
Findlay	.14
Gold Dollar	.11½
Gold Sovereign	.03¼
Isabella	.22¾
Jack Pot	.07¼
Jennie Sample	.07½
Jerry Johnson	.06¼
Lexington	‡.02
Mary McKinney	.39
Pharmacist	.03⅛
Portland	80
U. G. M.	.05
Vindicator	55
Work	06.¼

Assessments

Company.	Delinq.	Sale.	Amt.
Alpha, Nev	July 15	Aug. 6	$0.05
Best & Belcher, Nev	July 20	Aug. 10	0.10
Black Jack, Utah	June 15	July 8	0.01
Brunswick Chol., Nev	July 10	Aug. 2	0.01
Brunswick Potosi, Nev.	July 10	Aug. 2	0.01
Bullion, Nev	June 14	July 13	0.05
Caledonia, Nev	July 23	Aug. 13	0.05
Challenge Con., Nev	June 22	July 13	0.05
Mexican, Nev	June 28	July 14	0.10
Mountain Dell, Utah	July 19	Aug. 5	0.01½
N. Y. Bonanza, Utah	July 10	July 31	0.03
Potosi, Nev	July 9	Aug. 2	0.10
Progressive, Utah	June 23	July 14	0.01
Scottish Chief, Utah	July 7	Aug. 4	0.01
Seg. Belcher, Nev	July 7	July 29	0 03
Seven Troughs Mon., Nev.	June 23	July 10	0.00¾
Sierra Nevada, Nev	July 15	Aug. 10	0.10
Silver King Con., Utah	July 6	July 17	0.10
Union Con., Nev	June 28	July 19	0 10
W. Con. Va., Nev	July 16	Aug. 10	0.10
Yellow Jacket, Nev	July 13	Aug. 5	0.25

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1908.	1909.	1908.	1909.
January	55.678	51.750	25.738	23.834
February	56.000	51.472	25.855	23.706
March	55.365	50.468	25.570	23.227
April	55.505	51 428	25.133	23.708
May	52.795	52.905	24.377	24 343
June	53.663	52.538	24.760	24.166
July	53.115	.....	24.514	.....
August	51.683	.....	23.858	.....
September	51.720	.....	23.877	.....
October	51.431	.....	23.725	.....
November	49.647	.....	22.933	.....
December	48.766	.....	22.493	.....
Year	52.864	.....	24.402	.....

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1908.	1909.	1908.	1909.	1908.	1909.
January	13.726	13.893	13.901	14.280	62.386	57.688
February	12.905	12 949	13.098	13.295	58.786	61 198
March	12.704	12.387	12.875	12 826	58.761	56.231
April	12.743	12 56½	12.928	12.93½	58.331	57.363
May	12.598	12.893	12.788	13.238	57 387	59.338
June	12.675	13.214	12.877	13.548	57 842	59.627
July	12.702	.....	12.933	.....	57.989	.....
August	13.462	.....	13.639	.....	60.500	.....
September	13.388	.....	13.600	.....	60.338	.....
October	13.354	.....	13.646	.....	60 139	.....
November	14.130	.....	14.386	.....	63.417	.....
December	14.111	.....	14.411	.....	62.943	.....
Year	13.208	.....	13.424	.....	59.902	.....

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1908.	1909.	Month.	1908.	1909.
January	27.380	28 060	July	29.207	.....
February	28.978	28.290	August	29.942	.....
March	30.577	28.727	September	28.815	.....
April	31.702	29.445	October	29.444	.....
May	30.015	29.225	November	30 348	.....
June	28.024	29 322	December	29 154	.....
			Av. Year.	29.465	.....

Prices are in cents per pound.

LEAD

Month.	New York.		St. Louis	London.	
	1908.	1909.	1909.	1908.	1909.
January	3.691	4.175	4 025	14.469	13 113
February	3.725	4.018	3.868	14.250	13 313
March	3.838	3.986	3.835	13.975	13.438
April	3.993	4 168	4.051	13.469	13.297
May	4.253	4.287	4.214	12.938	13.225
June	4.466	4.350	4 291	12.600	13.031
July	4.744	.....	.....	13 000	.....
August	4.580	.....	.....	13.375	.....
September	4.515	.....	.....	13.125	.....
October	4.351	.....	.....	13.375	.....
November	4.330	.....	.....	13.538	.....
December	4.213	.....	.....	13 156	.....
Year	4.200	.....	.....	13.439	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York		St. Louis.		London.	
	1908.	1909.	1908.	1909.	1908.	1909.
January	4.513	5.141	4.363	4.991	20.563	21.425
February	4.788	4.889	4.638	4.739	20.875	21.563
March	4.665	4.757	4.527	4.607	21.075	21 438
April	4.645	4.965	4.495	4.815	21.344	21.531
May	4.608	5.124	4.458	4.974	19.906	21.975
June	4.543	5.402	4.393	5.252	19.000	22.000
July	4.485	.....	4.338	.....	19.031	.....
August	4.702	.....	4.556	.....	19.350	.....
September	4.769	.....	4.619	.....	19.563	.....
October	4.801	.....	4.651	.....	19.750	.....
November	5.059	.....	4.909	.....	20.875	.....
December	5.137	.....	4.987	.....	20.625	.....
Year	4.726	.....	4.578	.....	20.163	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.